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VOL. XLIV. PART 1. JANUARY 1, 1933.

Agricultural Gazette of New South Wales.

Rabbit Destruction.

METHODS WHICH HAVE GIVEN MOST PROMISE.

The destruction of the rabbit is an important aspect of the operations of the farmer and grazier, and the following notes on the methods which have given most promise have been obtained from reports and articles by Veterinary Officers, Inspectors of Stock, and Rabbit Inspectors, who have had actual experience in the work, particularly Mesrs. F. Gavel and C. J. Woollett, Stock Inspectors, and T. P. Glennan, Rabbit Inspector. While they contain nothing new, and are probably known to men of experience on the land in rabbit-infested districts, they may be of value to new settlers and those in districts which have only within recent years become infested.

Rabbit-proof Fences.

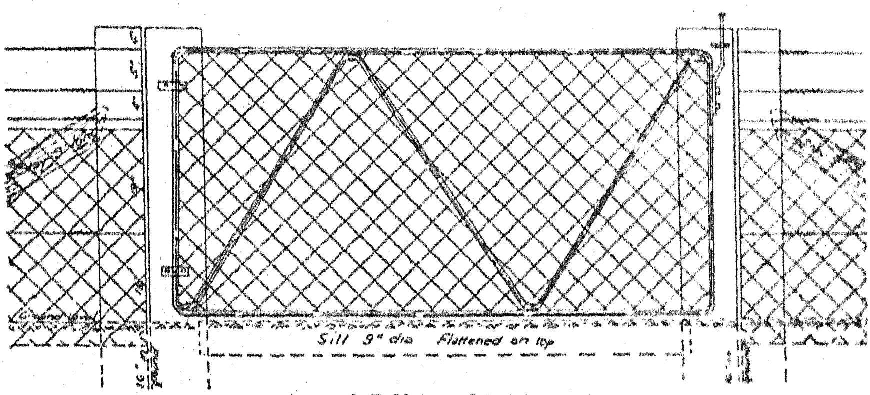
ONE of the first steps to decide in considering the question of freeing land from rabbits is whether it will pay or not to erect rabbit-proof fences. Generally speaking, it may be said that it will be a satisfactory investment, and it is the only way in which freedom from rabbits can be maintained. Practically the only exceptions are to be found in poor, scrubby and rough country on which the expenditure might well be greater than the value of the land. Money spent in poisoning, trapping, and fumigating without the property being previously netted is (in a sense) money wasted, as it will be a recurring expenditure and will only give temporary relief, though if thoroughly done it may give very efficient temporary relief. Where the whole property is not netted, the best lands should be fenced off from the poorer parts. If the holding is of any size, in addition to the netted boundary fence subdivision netted fences should also be erected.

The best rabbit-proof fences are those constructed of wire netting 42 inches wide, 1¼ inch mesh, and 17 gauge, placed 6 inches in the ground and 3 feet out. The fence panels are not usually of the 9 to 10 feet variety, but are made longer with heavier posts, interspaced with droppers and protected by barbed wire. For a distance of a chain or so on both sides of the fence a line should be cleared of all timber lying about, and of all standing trees which are likely to fall on the fence. All burrows and warrens within that distance of the fence, however large they are, must be dug out, as otherwise they will sooner or later cause trouble. This work is better done before the fence goes up. The work outlined above will save the fence from damage by falling branches and trees, enable it to be readily inspected either on horseback or by vehicle, and in times of bush fires will prevent much loss.

It is advisable to use the best grade of wire netting on account of its greater resistance to stock, especially large stock, and its durability. The netting is best placed on the outside of the boundary fence (in watercourses it should be hung on the lower side) and tied securely to a wire which should be level with the top of the netting. No. 8 wire is satisfactory, but

the high tensile wire now obtainable is the more economical. Attaching the netting to one or more wires a foot apart in the fence will strengthen it considerably and hold it in an upright position. The netting should be put straight into the ground to a depth of 6 inches. The idea of curving the netting in the ground is not good, as it must facilitate the passage of the rabbit one way, and to be efficient a rabbit-proof fence should be an obstacle to the movement of the rabbits in either direction. The more the movements of rabbits are hindered the less breeding will take place.

When fences are erected across creeks or other watercourses, the netting should be hung on the lower or down stream side, as in flood time the netted fence will be damaged by the weight of rubbish brought down. Provision for floods can be made by erecting flood gates, which will fall automatically under pressure or can be lowered and raised again when floods have passed, or in the following manner: On the lower or down stream side of the fence secure the bottom edge of the netting to a good bed log which is fastened in the ground and will not wash out. Then loop up the netting on wire hooks



A Rabbit-proof Gate.

Note how this gate closes on to, and not inside, the post; it is hinged in the same way.

[*From "Report on Rabbit Menace in New South Wales," by D. G. Stead.*

in such a way as will give fair resistance in flood time, but will give way under heavy pressure and, falling down stream, will allow water and flood debris to pass over it.

Rabbit-proof Gates.

On roads where there is much traffic it is important that gates be strongly made and well hung. The gate should hang on a separare post, and the bottom of it should be a little higher than the ground thereabout. This will permit of putting in a fair-sized ground plate and building up the roadway so as to prevent water lodging there. The ground plate should have a flat surface, and will be all the more durable and firm by having a heavy plate on each side. When strainers are used as gate posts it is not long before the contraction of the wires causes some slight give, and the gate becomes no longer rabbit-proof.

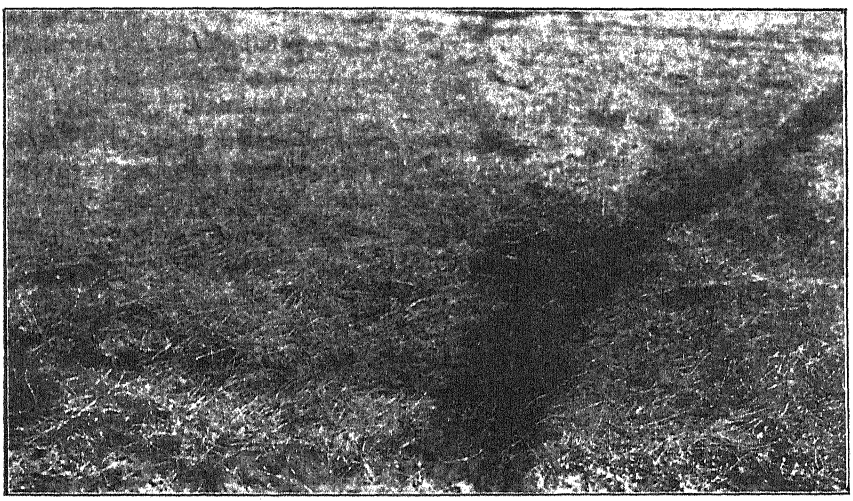
Gates should be of good width, and provided with guard posts firmly erected. All harbour and rubbish should be cleared away from the neighbourhood of the gates.

Destruction of Surface Harbour.

All hollow logs, hollow trees, collections of rubbish, masses of undergrowth such as blackberry and lantana, and anything which will give surface cover to the rabbit should be destroyed.

Destruction of Burrows and Warrens.

If the eradication of the rabbit is aimed at, all burrows and warrens must be dealt with. The most thorough method of dealing with them is to dig them out. In doing so, the trenches are best kept open while at work, the



A Good "Set."

The "pad" between the rabbit warren and the river is clearly shown. A spring trap—not visible, of course—is set in the wide portion in the foreground.

[*From "Report on Rabbit Menace in New South Wales," by D. G. Stead.*

earth being thrown clear and all branches and all off-shoots marked as they are found, in order that they may not be lost sight of. The burrow must be dug out to the last end if no rabbits are to be missed. The use of dogs to drive the rabbits underground will make the work more effective.

Where the areas to be treated are large and the nature of the country and the soil make it feasible, digging in the burrows to a uniform depth, or ploughing them, will be satisfactory, provided continued watch is maintained afterwards, and any burrows found opened up are treated by fumigation. Horses and bullocks can both be used with either a road, dam sinking, or large disc plough. In addition to the ploughing, the tramping of the bullocks will force in the burrow and destroy its value for

the rabbit. When the rabbits have taken possession of hilly, rocky country, ploughing will be impossible and digging out difficult, but as far as possible the burrows should be broken up with spade and mattock and plugged. In extreme cases it will be more satisfactory to fence off such places and destroy by poision and fumigation.

Trapping.

The trapping of rabbits is viewed in two lights. First, from the commercial aspect, and second, with the idea of eradicating the rabbit. Only the second viewpoint will be seriously considered here. Trapping alone will never exterminate rabbits over a large area, but it is very useful in reducing their numbers, and in assisting in finally clearing up a holding on which other work has been proceeding and which is netted in.

The type of trap most widely used is the steel spring trap, which is set about the warrens and other places frequented by the rabbits. This is also the most efficacious trap, but the supervision of the numbers which are required if any serious work is to be done means a considerable amount of work, a good deal of which must be carried out at night.

The number of traps which one man can work varies with the country, but probably ranges from 70 to 100. In commercial trapping the traps are usually set at the feeding grounds, buck heaps, etc., but if rabbit extermination is sought they will also be set at and near the mouth of burrows. The ordinary trap is not made fine enough for rabbit work, and the trapper files the catch down to suit himself.

To set the trap, an oblong depression is made in the soil, level at the bottom, and sufficiently large just to take the trap, so that the trap sets firmly. The trap is placed in this, and the peg driven into the soil. The plate of the trap is covered with a small piece of paper to keep dirt from falling through, and then gently and smoothly covered with a little soil. Traps should be cleaned and not contaminated with anything possessing an odour.

Pit traps are of value where rabbits are on the move along the fences. They are so constructed that when the weight of the rabbit comes on to the top of the trap it is precipitated into the pit. In country which is fairly clear and well subdivided by fencing, pit traps are not of great utility. In rocky country, river banks, and in places where the last few rabbits are being sought, wire netting traps fitted into the mouths of the burrows are of value, especially as they will catch kittens as well as adult rabbits. For commercial work they are of little value.

Fumigation.

By fumigation is meant the introduction into the burrows, usually under pressure, of toxic gases or of finely divided powders which liberate toxic gases after their introduction. The gases chiefly employed are carbon bisulphide, carbon monoxide, and hydrocyanic acid gas.

In using any gas, the most satisfactory results will undoubtedly be obtained if a pump is used to force the gas or powder into the burrow. Special pumping machines can be purchased for use with carbon bisulphide or calcium cyanide (to produce hydrocyanic acid gas). The pump employed with carbon bisulphide has also a smoke-producing apparatus affixed, as the gas is colourless, but this is not required with calcium cyanide. Carbon monoxide and associated gases are produced by the burning of straw or any vegetable rubbish, and the smoke and gases drawn off from the burning material, which is carried on a specially constructed machine, are forced into the burrow by an attached pump and a length of hose pipe.

The same gases can be employed by using the exhaust fumes from a motor car; these can be conveyed into the burrow by means of a piece of hose pipe attached to the exhaust.

Whatever gas is to be employed, the work should be undertaken systematically, and the country worked on a face. A pack of dogs should be actively employed driving the rabbits underground, and surface rabbit harbour should be destroyed as the work proceeds, so as to give the rabbit no cover except in the burrows. The burrows should then be taken one by one and fumigation commenced by introducing the hose pipe into one or more openings of each burrow, and closing up all the others as soon as smoke is seen issuing from them. When suffiicent gas has been forced in (and experience will soon show what is required), the last openings are closed and the burrows left. Each day investigation should be made to see if any burrows in the part of the holding already treated have been opened up, and they should be re-treated or traps set in such opened up burrows. In addition a few traps in well-selected spots will assist in reducing the number of the rabbits missed.

Fumigation is quite a valuable factor in rabbit extermination, but it requires backing up in most cases with other methods to make a complete success. Combined with the destruction of harbour and ploughing in of burrows, it is very effective. If surface harbour is left it cannot be properly effective, except by numerous repetitions.

Where the number of burrows and the area of ground are small the destruction of the rabbits by gases can be effected without the purchase of any machinery. Calcium cycanide flakes may be purchased, and introduced into the openings of the burrow by means of a long-handled spoon. The burrow should then be closed up. The gas is generated somewhat more slowly, but it is quite effective.

Carbon bisulphide may also be purchased alone, and balls of cotton waste or old sacking saturated in it can be pushed well into the openings of the burrows and the openings closed. Fumigation is harmless so far as live stock and birds are concerned.

Poisoning.

Rabbits are usually poisoned by the use of what are known as baits. These baits are composed of a mixture of some food with a poisonous

material, to which is often added some substance with an odour which is supposed to attract rabbits. These odorous materials are called decoys, and while at times they appear useful in attracting rabbits, at other times equally satisfactory work is done without them. The commonest poisons used are phosphorus and strychnine.

Phosphorus is usually employed made up with a mixture of bran, pollard, sugar or treacle, and cinnamon or aniseed. If phosphorus itself is used a little carbon bisulphide will be required to dissolve the phosphorus. There are, however, various commercial poison mixtures which can be purchased ready made for dissolving and mixing with the pollard. It should be remembered that phosphorus is inflammable, and should be kept under water when not in use.

The following methods of using phosphorus are given as examples:—

(1) Ingredients: Phosphorus, carbon bisulphide, molasses, oil of linseed, pollard, and bran.

Take a clean pickle bottle, and half fill it with water, adding two tablespoonfuls of carbon bisulphide (merely to dissolve the phosphorus, and a lesser quantity will do if it is allowed to stand overnight); then break under water and add to the contents of the bottle two sticks of phosphorus, and in an hour's time the mixture will be ready for the pollard, etc.

Procure a tub (a wooden one is best) and put 2 gallons of clean water into it. Then stir in a quart of molasses and a teaspoonful of oil of aniseed. Add the contents of the pickle bottle, straining through a piece of chaff bag or hessian (in case of undissolved particles of phosphorus). Stir well to mix thoroughly, then add the pollard, which if very fine will be all the better for a few handfuls of bran. Keep stirring and adding pollard slowly, until the right consistency is obtained. Your bait is now ready for use. Be careful not to make it too stiff at first until it is tried in the poison cart. See to it that the cart is in good working order and free from any old sour bait, also that no string from the pollard bag gets into the mixture and interferes with the proper working of the machine.

The above-mentioned mixture should be laid whilst fresh and sweet. It may, in cool weather, hold sweet for a day or two, but the fresher it is the better. There is absolutely no danger of fire if the above directions are attended to, and the above quantities will provide enough bait for a full day's work, if put through the usual form of poison cart.

It is important that the baits should not be too soft. How to gauge the correct consistency will come with experience. If too much water is used the baits are not cut properly, and they stick to each other, with the result that long rolls are put out. In such cases there is danger to stock, as well as waste. The proper quantity of water depends on the quality of the pollard. If the operator is treating fairly level ground and has a strong horse, he should be able to put out two tins of poison in a day of eight hours.

(2) Ingredients: Two tins commercial poison containing phosphorus, 14 lb. pollard, 2 lb. bran, 2 lb. brown sugar or treacle, 1 dessertspoonful ground cinnamon, 6 to 7 quarts water.

The ingredients are best mixed in a tub. The poison should be dissolved in about 4 quarts of warm water and thoroughly stirred. The sugar should be dissolved in water before being added, and all the ingredients should be mixed to a thick doughy consistency. If the rabbits have not been interfered with for some time they will generally take the bait without sugar or cinnamon. When they become a little "poison shy" then add one or both of those ingredients.

The best time to use the poison cart is after a dry spell when rain falls in sufficient quantity to soften the ground and feed is beginning to grow, or when the feed is ripening. If practical, the best time of the day to set out phosphorised pollard is late in the afternoon, as the sun makes the bait hard and less attractive.

It must be remembered that rabbits take two or three days to die from the effects of phosphorus, unless they have eaten many baits, when they will be found near the trail.

Strychnine is generally used with black thistle root, apple, carrot, or other firm vegetable matter which will attract the rabbit as food. One method of preparing strychnine poison for rabbits is as follows:—

Dig up green roots of the black thistle, and having washed them free of soil and scraped off the "whiskers," cut them into baits about half an inch square. Then place them on a clean chaff bag to dry out most of the natural moisture, and while this is being done the strychnine can be made ready for use. Grind to a powder as fine as flour an ounce of the best strychnine, and have the roots ready, the quantity of which can be measured easily with an empty 2 lb. jam tin. Ten tinfuls of roots will yield approximately 2,500 baits, and by sprinkling them with the strychnine and shaking them well, the poison will be well distributed over the roots.

Thistle root and strychnine may be laid by hand in trails made for the purpose by a hoe or other trail-making means. Where extensive bait-laying is to be done, the ordinary poison cart is best. Take off the gear-driving chain and fix a large funnel above the spout of the cart, and the bait can be dropped through it into the furrow as close or as far apart as desired.

This bait has the advantage of quick action, most of the rabbits being killed either right on the trail or at no great distance from it. This makes it an easy mater to gather the carcases and secure the skins, if so desired. The bait retains its destructive properties for several days unless much rain falls on it.

Whilst the use of poisons in these ways is sometimes very effective, there is undoubtedly risk of poisoning stock, and particularly sheep, whilst there is more than a suspicion that native birds have been destroyed in the

same way. Nevertheless, in some areas it still remains one of the useful methods for destroying rabbits. It is doubtful if alone it would ever exterminate them.

Poisoned Water.—In inland country, where water is scarce and holdings so large that most of the methods of rabbit destruction practised in the Eastern and Central Divisions cannot be utilised, poisoned water is the chief agent used in rabbit destruction. This method of destruction is naturally of most value in dry periods. To be effective it requires the fencing off of the stock water supplies, so that the rabbits cannot get at them. Poisoned water is then exposed in troughs or otherwise, in such manner that the rabbits can obtain access to it, but stock cannot. The arrangements made will naturally vary with the circumstances of each case. Arsenic is the poison chiefly used. A mixture made as follows will be effective:—Arsenic, 2 oz.; washing soda, 4 oz.; water, 1 gallon.

Boil these quantities until the arsenic is dissolved: add 2 oz. sugar, and stir well. For use, add 2 gallons of water.

Strychnine may also be used at the rate of 1 oz. dissolved in one-third of a pint of acetic acid added to 12 gallons of water.

A Warning.

Whatever method of rabbit destruction is utilised, thoroughness is essential. It must not be forgotten that most of the agents used in rabbit destruction are harmful. Calcium cycanide gives off poisonous fumes, carbon bisulphide is poisonous and inflammable, phosphorus is inflammable, and arsenic, strychnine, and phosphorus are deadly poisons. All these should be handled with care, and should be stood well out of the reach of children.

Rabbit Destruction by Disease.

Although many proposals have been put forward for the destruction of rabbits by disease, none have so far been found both practicable and safe. The most extensive investigations were carried out with what is known as the Danysz virus. After exhaustive tests and an investigation by an independent committee, the conclusion was arrived at that, although no danger to native Australian fauna or domesticated animals was to be feared, there was little, if any, prospect either of the use of the micro-organism concerned bringing about the desired result, as it was found that is was apparently present in Australian rabbits, and occasionally led to localised mortalities. This is not the only example of a micro-organism commonly found in some species of animal which, under certain conditions, becomes accentuated in virulence and causes mortality. These conditions cannot be reproduced artificially amongst animals in a state of nature, and consequently such organisms are of very little value as agents of destruction.

Another disease which was widely investigated was chicken cholera. The causal organism of this disease will infect rabbits providing they ingest

it, but as it does not spread its use would be in no way superior to poison, added to which it has the disadvantage of infecting birds.

There are not infrequently localised mortalities due to coccidiosis of the liver, but this parasite is so widespread already in Australian rabbits that it is obviously useless as a means of reducing their numbers. None of the other known internal parasites of the rabbit have had any appreciable effect on the pest. The same may be said of those external parasites which have been studied. A disease known as rabbit myxoma was investigated not long ago at Glenfield Veterinary Research Station, but it was considered too dangerous to proceed further.

The likehood of any disease condition being found which would be really effective in reducing the rabbit pest to such an extent as to warrant action is very remote. To be of value such a disease must—

(*a*) spread readily amongst rabbits in a state of nature;

(*b*) not produce immunity;

(*c*) be harmless to all native fauna, domesticated animals and birds and man.

Every opportunity is being taken, however, to exploit the possibilities of this method of attack, and the mortality reported among rabbits recently in various districts is of interest in this relation. It is asked that landholders co-operate with the Department by advising local inspectors of stock when they observe such mortality or sick rabbits, from which material for dispatch to Glenfield Veterinary Research Station may be obtained.

"The Trees of New South Wales."

In the process of Australian land settlement our tree life suffered to an often unnecessary extent, and among progressive farmers there is evident a growing interest as to how the effect of this indiscriminate destruction may be repaired. Trees, such farmers realise, have an important relation to agricultural and pastoral economy, to say nothing of that leafy attractiveness which should be a feature of every rural home.

A useful publication in this connection is the recently issued handbook "The Trees of New South Wales." A well-illustrated volume of almost 250 pages, by Mr. R. H. Anderson, Assistant Botanist, Sydney Botanic Gardens, and Lecturer in Forestry at Sydney University, it constitutes a non-technical and yet authoritative guide on the subject with which it deals. The native and introduced trees of the State, their botanical features, distribution, soil requirements, general usefulness and cultivation are fully discussed, the utility of the various species from the farmers' and pastoralists' points of view being particularly emphasised. A valuable feature is a key by which any particular specimen which it is desired to identify may be determined.

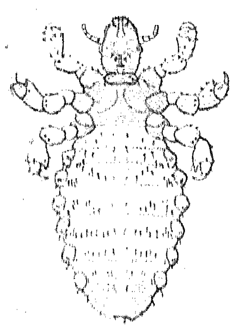
Well indexed, and strongly bound in a cloth cover, this publication deserves a place on every farmer's bookshelf. It is obtainable from the Department of Agriculture, Box 36A, G.P.O., Sydney, price 5s. 6d. (postage included).

The Cattle Louse *Solenopotes capillatus*.

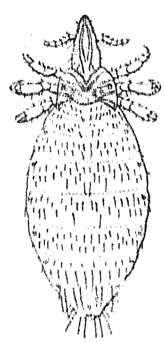
RECORDED FROM NEW SOUTH WALES.

R. N. McCULLOCH, B.Sc., B.Sc.Agr., and N. S. NOBLE, M.S., D.I.C., B.Sc.Agr., Assistant Entomologists.

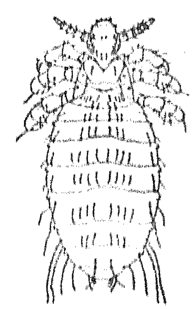
SOME specimens of parasitic insects found on cattle at Turramurra, New South Wales, and received at the Entomological Branch on 13th June, 1932, were identified as sucking lice of the species *Solenopotes capillatus* Enderlein. This was, at the time, thought to be the first record of the insect in Australia, but in the *Journal of Agriculture*, Western Australia, for June, 1932, B. A. O'Connor describes and figures specimens of the species taken on cattle near Perth in March of the same year.



Hæmatopinus eurysternus.



Linognathus vituli.



Solenopotes capillatus. [*After* Bishopp.

Originally described from a male specimen only by Enderlein in Germany in 1904, *Solenopotes* was recorded from the United States in 1921, and shown to have a wide distribution there. It was found in England a little later. This species is smaller than the two common sucking lice of cattle, *Haematopinus eurysternus* Nitz., and *Linognathus vituli* Linn., both of which, like it belong to the family *Haematopinidae*. The three may be distinguished by the fact that *Haematopinus* has all its legs equal or nearly equal in size, while *Linognathus* and *Solenopotes* have their first pair of legs distinctly smaller than the other two pairs. *Solenopotes* is further distinguished by having its six pairs of abdominal spiracles opening through tubular processes at the sides of the body. The processes do not occur in other members of the family.

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Mineral Deficiency in the Southern Coastal Belt of New South Wales.

A Preliminary Survey.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon, and M. S. BENJAMIN, D.I.C., Lond., A.A.C.I., First Analyst, Chemist's Branch.

The mineral content of pastures in relation to nutrition and animal metabolism and, more particularly, in relation to the nutrition of highly-bred dairy cattle, has been the subject of a considerable amount of research during recent years. The work of Theiler, du Toit and other investigators in South Africa; Orr and his collaborators at the Rowett Institute, Aberdeen; Hart, Steenbock, McCollum and Eckles in America; and Brailsford-Robertson, Henry, and Aston in Australia and New Zealand has demonstated the important part which the mineral constituents of pastures and other stock foods play in animal life and welfare.

A Considerable Area of the State Affected.

Mineral deficiency and related nutritional studies must be regarded as of particular interest so far as this State is concerned, owing to the pre-eminent position which livestock and livestock products occupy among its economic resources. Moreover, the area of the State which is involved in this deficiency is very considerable. It would hardly be an exaggeration to say that the coastal belt of New South Wales with the exception of that portion which lies north of the Richmond River is essentially a belt of mineral deficient country. It is only in those isolated areas where basaltic outcrops occur, as at Tilba and Kiama, or where river flats have been formed by the deposition of soil brought down by floods, that evidence of such a deficiency is wanting, although the degree of deficiency is by no means uniform. Wherever osteophagia and osteomalacia exist there is warrant for regarding the country as probably mineral deficient. Henry[1], so far back as 1915, indicated that his observations showed that during the previous ten years there had been a marked increase in the area of the far southern coastal belt in which these symptoms were observable. Since then the condition has been noted in an ever-widening range, involving not only the coastal but the inland country.

Recent unpublished official reports by Rose indicate the extent to which Eastern Riverina is involved. The same officer has remarked on the condition near Hillston, almost in the centre of the State. Hindmarsh has reported it from the Brunswick Valley north of the Richmond River, whilst Blumer records the presence of an intense osteomalacic condition in sheep on the Upper Clarence.

That both the area involved and the intensity of the condition should increase is no surprise to observers who have been following the trend of events for the past twenty years and who have examined the history of the State during the past century. Generally speaking, Australian soils are of a low phosphorus content. On many of these phosphorus-poor soils dairy cattle have been grazed for periods up to one hundred years and nothing whatever has been returned to the soil to balance what was taken out and exported as milk, butter, cheese and meat. Naturally the poorer the soil the sooner it proved incapable of maintaining cattle in reasonable health, then the medium country showed signs of being unable to maintain the strain, and now better country still is proving inadequate. It may be argued perhaps that if these facts are so definitely noted, the work embodied in this paper was unnecessary. As a matter of fact, however, whilst there is no reason to doubt the soundness of the conclusions previously arrived at, that the basal cause of the unthriftiness and ill-health of the cattle in the areas concerned was, roughly speaking, a calcium-phosphorus—chiefly phosphorus—deficiency in the soil, chemical analysis had only been carried out in a comparatively small number of instances. No extensive series of analyses was on record. In addition the suggestion has been put forward by more than one observer that in parts of the coastal belt, notably at Bergalia, the calcium-phosphorus deficiency theory does not fully account for the clinical picture presented by the cattle. Since the last publication of any work on the subject in this State much work has been done elsewhere, and it is desirable to see whether the conclusions previously arrived at will stand the test of fuller investigation in the light of that work.

The following paper is a small contribution to the study of this important and many-sided subject, and embodies the main results obtained in a "deficiency survey" of portions of the counties of Auckland and Dampier in the Eden Pastures Protection District. The work so far carried out, though admittedly of a preliminary nature, has yielded data which it appeared desirable at this stage to collate and make available.

Incidence of Osteomalacia.

In the area over which this deficiency survey has been attempted, which includes the parishes of Congo, Moruya, Narira, Tanja, Ooranook, Eurobodalla, Kameruka, Bega, Wolumla, Bondi and Genoa, dairying is extensively carried out and natural pasture constitutes the main feed throughout the year of most of the herds. Sterilised bonemeal and similar licks are fed to stock on many of the properties, and this fact makes it somewhat difficult to determine exactly, and map out, the distribution and intensity of osteomalacia in the parishes referred to. Nevertheless, by direct observation, the collection of chemical and other data over long periods, and from the information supplied by district inspectors and stockowners as to the condition of stock on the various properties prior to the use of phosphatic

licks, it has been possible to indicate those regions which may be regarded as potentially affected, in addition to those in which osteomalacia now definitely occurs.

The Economic Aspect.

If the investigation of this question were purely one of scientific interest it would be difficult to justify the undertaking at the present time. On the contrary, however, it is a matter of really serious economic importance to this State. Rose[2] has well described the condition of the cattle on these deficient lands, and it requires no explanation to make the fact clear that such cattle cannot be effective producers. Moreover, the influence on growth of the administration of bonemeal to cattle in deficient areas has been repeatedly demonstrated here and elsewhere. The economic loss would be serious enough if it were confined to osteomalacia and its accompanying manifestations. To this loss, however, must be added that due to botulism. It is clear now, following the work of Seddon,[3] Theiler[4] and others that the mortalities which from time to time have occurred on the southern coastal belt and elsewhere were actually outbreaks of botulism brought about by the ingestion of toxin-infected, decaying animal matter, such as bones and rabbit carcases, by cattle suffering from pica induced by a calcium-phosphorus deficient diet. That such mortality may in dry seasons reach a factor of economic consideration was fully shown by Henry[1] in his report on mortality in cattle in the Bega district published in 1915. Other observers have since reported similar mortality.

The Calcium and Phosphorus Content of Soils.

In addition to the stock survey mentioned above, soils and natural pastures from a number of properties in the district have been collected and chemically examined. In the case of the soils it was decided to determine the percentage amounts of "citrate soluble" lime and phosphoric acid rather than the total amounts of these constituents extracted from the soil by a strong solvent such as hydrochloric acid. For this purpose the representative sample of soil was air-dried, finely sieved, and a definite weight of it digested with 1 per cent. solution of chemically pure citric acid for a period of seven days according to the original method of Dyer. The extract was filtered and after being subjected to the usual preparatory treatment, the calcium and phosphorus it contained was estimated by standard methods. The soil's reaction was determined electrometrically, using the quinhydrone electrode of Biilman[5] in the manner recommended by Prescott and Piper[6]. The Comber test was also employed and the results obtained are shown along with the pH values of the various soils examined.

The figure for "loss on ignition" was determined with the view of securing an approximate estimate of the soil's content of organic matter.

The general and analytical data obtained for fifty-six soils are shown in the following table:—

Soil sample No.	Parish and serial No.	Portion No.	River system.	Chief grasses in pasture.	Geological formation.	Nature of soil.	Moisture.
							Per cent.
†1	Congo 4 ...	22, 258.	Coila Lake ...	....	Basalt ...	Heavy chocolate loam.	7·00
†2	Congo 1 ...	9	Meringo Creek	Couch, bergalia, love, herbage	Basalt ...	Black clay ...	4·50
†3	Congo 2 ...	9	Meringo Creek	Love, paspalum, bergalia, herbage.	Basalt ...	Clay loam	6·90
†4	Congo 3 ...	9	Meringo Creek	Love, kangaroo	......	Light grey loam ...	1·40
*‡5	Moruya 4 ...	23	Moruya River..	....	Granite ...	Light grey loam ...	1·05
§6	Moruya 1 ...	135, 187, 188.	Moruya River..	Love, paspalum	Slate ...	Grey loam ...	1·55
*‖7	Moruya 2 ...	187, 188, 189.	Moruya River..	Rough grass in places, couch, etc.	Alluvial deposit.	Alluvial silt ...	4·10
‡8	Wolumla 1	71	Wolumla River	Mainly kangaroo; some love, little trefoil.	Granite and clay stone.	Brown loam ...	1·90
‡9	Wolumla 2	71, 72, 73.	Wolumla River	Love, kangaroo, trefoil, paspalum on low land.	Rotten granite and clay stone.	Brown loam ...	3·05
†10	Bondi 1 ...	4	Genoa River	Patches of stunted bracken ...	Granite ...	Grey sandy loam ..	0·85
*‖11	Genoa 1 ...	4, 5, 11.	Genoa River	....	Alluvial deposit.	Alluvial silt ...	3·85
‡12	Wolumla 3	121	Wolumla River	Love, kangaroo, trefoil, spotted.	......	Brown loam ...	3·95
‡13	Wolumla 4	87	Wolumla River	Kangaroo, love	Granite ...	Brown sandy loam	2·25
‡14	Moruya 3 ...	162, 163.	Moruya River..	Love, kangaroo	Granite ...	Greyish-brown sandy loam.	1·60
§15	Congo 8 ...	75	Congo Creek ..	Kangaroo, love, trefoil ...	Granite ...	Greyish sandy loam	1·10
‡16	Congo 9 ...	16	Congo Creek ..	Kangaroo, love, trefoil—Not as thick as No. 15.	Conglomerates sandstones.	Greyish sandy loam	0·85
‡17	Congo 10 ...	228	Coila or Stony Creek.	Paspalum, love, kangaroo ...	Slate ...	Greyish sandy loam	1·65
‡18	Congo 11 ...	229	Coila or Stony Creek.	Paspalum, couch, legume ...	Alluvial wash.	Light brown loam	1·90
‡19	Congo 5 ...	264	Coila or Stony Creek.	Love and other rough grasses	Slate ...	Grey sandy loam ..	1·75
‡20	Congo 6 ...	59	Coila or Stony Creek.	Couch	Silt and wash	Light brown loam	2·15
*‖21	Congo 7 ...	9	Congo Creek	Love, bergalia, legume, herbage.	......	Heavy dark clay loam.	2·60
‡22	Wolumla 5 ..	224, 223.	Wolumla River	Love, "silver," herbage ...	Granite ...	Brown loam ...	1·75
‡23	Wolumla 6 ..	95	Wolumla River	Love, kangaroo, herbage, trefoil.	Granite ...	Light grey sandy loam.	2·40
‡24	Wolumla 7 ..	95	Wolumla River	Love, kangaroo, herbage, trefoil.	Granite ...	Light brown sandy loam.	1·85
‡25	Mogilla 1 ...	42	Bemboka River	Love, kangaroo, trefoil, herbage.	Granite ...	Light brown sandy loam.	2·55
*‖26	Wolumla 8 ..	231	Wolumla Creek	Love, kangaroo, trefoil, herbage.	Granite ...	Light brown sandy loam.	2·30
‖27	Wolumla 9 ..	231	Wolumla Creek	Love, kangaroo, trefoil, herbage.	Granite ...	Light brown sandy loam.	2·25
‡28	Bega 1 ...	165	Bega River ...	Love, kangaroo, herbage ...	Granite ...	Light brown sandy loam.	1·35
‡29	Bega 2 ...	165	Bega River ...	Love, kangaroo, herbage ...	Blow of diorite.	Reddish-brown clay loam.	3·30
‡30	Bega 3 ...	61	Bega River ...	Poor, thin kangaroo, love, native oat.	Granite ...	Light brown loam	1·25

* Breeding was carried out on all properties except these. † Holding used for wool production.

Reaction.		Calculated on soil dried at 105 deg. Cent.			Estimated carrying capacity.	Period for which grazing carried on.	Clinical evidence of deficiency, and remedial measures adopted.
Comber.	pH. Quinhydrone.	Loss on ignition.	P_2O_5 available.	CaO available.			
		Per cent.	Per cent.	Per cent.		Years.	
Very slightly acid.	6·20	15·26	·0034	·2516	1 sheep to acre.	90	Nil.
Very slightly acid.	5·88	9·37	·0020	·1256	1½ sheep to acre.	100	Stiffness of gait; dairying abandoned owing to prevalence of condition—A little bone-meal fed.
Very slightly acid.	6·07	13·15	·0022	·1933	1½ sheep to acre.	100	Stiffness of gait; dairying abandoned owing to prevalence of condition—A little bone-meal fed.
Strongly acid	5·63	4·92	·0014	·0527	1½ sheep to acre.	100	Stiffness of gait; dairying abandoned owing to prevalence of condition—A little bone-meal fed.
Strongly acid	5·87	4·14	·0029	·0485	1 beast to 10 acres.	80	Owing to effects of deficiency, this paddock is regarded as valueless—Nil.
Strongly acid	5·83	6·24	·0022	·0690	1 beast to 5 acres.	100	Osteophagia observed at times; stiffness of gait not noticeable—Feeds bran and pollard. Sheep appear to be improving in hill country. Licks supplied to sheep.
Very strongly acid.	4·31	9·90	·0106	·0604	......	100	An old tidal flat; cattle grazed on this area are said to improve, but the area is not of great value—Nil.
Very slightly acid.	5·52	8·10	·0038	·1712	1 beast to 4 acres.	80	Marked indications of deficiency; mortality, acute digestive disturbances—Bone-meal and salt are fed in bails, but many cows do not partake of it.
Slightly acid	5·69	9·23	·0038	·1671	1 beast to 4 acres.	80	Not affected to same extent as No. 8—Bone meal and salt are fed in bails, but many cows do not partake of it.
Slightly acid	5·07	2·92	·0009	·1008	1½ sheep to acre.	80 to 90	Osteophagia seen even in sheep; wool "hungry" and deficient—Licks of unknown composition supplied which appear to have some effect.
Strongly acid	5·32	10·34	·0080	·3161	......	90 to 100.	Nil.
Neutral ...	6·35	11·86	·0031	·4435	1 beast to 4 acres.	80	Cattle badly affected in the past, but now improving—Rock salt given, and several paddocks laid down with native grasses and clovers.
Very slightly acid.	5·83	8·43	·0042	·1787	1 beast to 4 acres.	80	Very badly affected—Rock salt given.
Acid ...	5·76	5·89	·0021	·1166	1 beast to 6 acres.	100	Mortality (botulism ?); digestive disturbances—Bone-meal lick provided; result unsatisfactory.
Strongly acid	5·35	4·29	·0019	·0974	1 beast 5 to 6 acres.	80 to 90	Deficiency symptoms noted unless phosphatic lick is used—Phosphatic lick used successfully.
Strongly acid	5·35	3·42	·0009	·0677	1 beast 5 to 6 acres.	80 to 90	Deficiency symptons noted unless phosphatic lick is used—Phosphatic lick used successfully.
Strongly acid	5·00	6·10	·0016	·0409	1 beast to 8 acres.	80 to 90	Deficiency symptoms noted unless remedial measures are taken—Bran fed heavily; has good results.
Strongly acid	5·14	6·26	·0024	·0713	1 beast to 8 acres.	80 to 90	Deficiency symptoms noted, same farm as No. 10 but better country; wash from the hills occurs, and the hilly country is not affected—Same as No. 17
Slightly acid	5·56	7·47	·0014	·1214	1 beast to 8 acres.	80	Osteophagia; general unthriftiness—Phosphatic lick and bran used spasmodically. When used results satisfactory.
Strongly acid	4·83	8·63	·0021	·0406	1 beast to 8 acres.	80	Osteophagia; general unthriftiness—Phosphatic lick and bran used spasmodically. When used, results satisfactory.
Acid ...	5·46	7·08	·0010	·1460	1 beast 4 to 5 acres.	80 to 90	Unusual histories of mortalities; typical osteomalacic syndrome not observed—Cattle removed after two or three months in paddock.
Acid ...	5·63	7·32	·0021	·1100	1 beast to 7 acres.	9	Very little deficiency apparent; osteophagia noted at times; stock will not eat bone-meal; country on both sides badly affected—Nil.
Acid ...	5·76	7·94	·0014	·1164	1 beast 3 to 4 acres.	9	Deficiency very marked; osteophagia, malformations, rough staring coats—Phosphatic lick now used, and no marked trouble experienced.
Acid ...	6·11	6·62	·0030	·1158	1 beast to 3 acres.	9	Osteophagia, malformations, stiff gait—Phosphatic lick used with success.
Very slightly acid.	6·42	7·85	·0018	·1936	1 beast to 6 acres.	60 to 70	Osteophagia; 25 per cent. of herd very ragged and rough when seen—Phosphatic lick used lately erratically.
Acid ...	6·21	6·29	·0029	·1106	1 beast to 3 acres.	50 to 60	Malformations, stiff gait, pica—Phosphatic lick used with success. Top-dressing with superphosphate.
Acid ...	6·07	5·06	·0022	·0819	1 beast to 3 acres.	50 to 60	Malformations, stiff gait, pica—Phosphatic lick, bone-meal used with success.
Slightly acid	6·42	6·53	·0032	·1436	1 beast 6 to 7 acres.	80 to 90	Osteophagia, stiff gait, rough, harsh coats—Lick being given with reported good results.
Acid ...	6·03	11·22	·0036	·2270	1 beast 6 to 7 acres.	80 to 90	Nil. (same farm as No. 28, but a different paddock)—Nil.
Acid ...	5·86	7·24	·0020	·0941	1 beast 6 to 7 acres.	80 to 90	Osteophagia; stiff gait; rough coats. Same farm as Nos. 28 and 29—Lick being given with some result.

‡ Holding used for dairying. § Holding used for dairying and sheep. || Holding used for grazing.

Soil sample No.	Parish and serial No.	Portion No.	River system.	Chief grasses in pasture.	Geological formation.	Nature of soil.	Moisture.
							Per cent.
*‖31	Bega 4 ...	62	Bega River ...	Poor sward, very light and short. Fair grass among ferns, which hold moisture and humus.	Light granite and slate.	Light brown loam, with loose stone subsoil.	1·10
‡32	Kameruka 1	91	Wolumla River	Mainly kangaroo grass, of a spindly nature; some herbage, mainly dandelion; thin sward of grass.	Granite and slate.	Light brown loam, with gravel subsoil 5 to 7 inches down.	1·45
‡33	Kameruka 2	9	Wolumla River	Kangaroo, love, native oat, also fair herbage (trefoil, dandelion); good sward, but short.	Granite ...	Dark brown loam ..	2·65
‡34	Tanja 1 ...	21	Wapengo Creek	Love and kangaroo grass, not much herbage.	Monzonite and porphyry.	Chocolate loam ...	2·15
‡35	Tanja 2 ...	21	Wapengo Creek	Love and kangaroo grass, very little herbage.	Monzonite and porphyry.	Dark brown loam, with gravel subsoil.	1·7
‡36	Tanja 3 ...	24	Wapengo Creek	Heavy coating of love and kangaroo grass, with fair amount of trefoil, etc.	......	Dark brown loam ..	1·9
*‖37	Wolumla 11	208	Wolumla Creek	Long, rough kangaroo, with patches of love grass, trefoil, and other weeds.	Granite ...	Light brown sandy loam, with gravel subsoil.	1·65
†38	Wolumla 10	237	Wolumla Creek	Kangaroo, love, trefoil, and other herbage.	Granite ...	Light brown sandy loam, with gravel subsoils.	1·45
‖39	Congo 14 ...	87	Congo Creek ..	Kangaroo and love grass, herbage and weeds.	Rotten granite overlying clay.	Light brown clay loam.	1·15
‡40	Congo 12 ...	9	Congo Creek ..	Cocksfoot and kangaroo grasses; some herbage and cat's ear.	Basalt ...	Heavy black clay loam.	6·45
‖41	Congo 13 ...	9	Congo Creek	Kangaroo, love, and couch grasses and cat's ear.	Granite and slate.	Light brown sandy loam, with gravel subsoil.	0·85
‡42	Tantawanglo 1.	186	Bemboka River	Love, kangaroo, cocksfoot, and rye grasses, cat's ear, and trefoil.	Rotten granite and slate.	Light brown sandy loam, with broken stones of rotten granite 5 to 7 ins. down.	1·15
‡43	Ooranook 1	2A, 106.	Bemboka River	Love, kangaroo, trefoil, and cat's ear.	Light rotten granite.	Light brown sandy loam.	1·80
‡44	Yuglamah 1	44	Towamba River.	Kangaroo, a little blue grass, and some herbage.	Rotten granite.	Light brown sandy loam.	1·75
‡45	Imlay 1 ...	33	Towamba River.	Kangaroo, Parramatta, and fairy grasses, and some herbage.	Rotten granite.	Light brown sandy loam, with gravel subsoil.	1·45
‡46	Narira 1 ...	62	Narira Creek ..	Paspalum, some natural grasses and trefoil.	......	Light brown sandy loam, with gravel subsoil.	1·45
‡47	Narira 2 ...	62	Narira Creek ..	Paspalum, a good deal of natural grasses, very little trefoil, or other herbage.	......	Light brown sandy loam, with gravel subsoil.	1·85
*‖48	Congo 15 ...	254	Bergalia Creek	....	Rotten granite.	Light brown sandy soil, with yellow clay subsoil.	1·10
‡50	Tanja 4 ...	7	Wapengo Creek	Rye, cocksfoot, paspalum, love, and Parramatta grasses; also good natural trefoils.	Monzonite and porphyry.	Heavy black and chocolate soil.	3·65
‡55	Moruya 5 ...	24	Moruya River..	....	Granite ...	Brownish-grey sandy loam.	1·6
‡56	Urobodalla 1	1	Tuross River...	....	Rotten slate	Grey loam ...	1·35
‡65	Congo 17 ...	69	Stoney Creek ..	Couch, patches of kangaroo grass, and paspalum.	Basalt ...	Heavy black soil ...	7·5
§66	Congo 18 ...	86	Coila Lake ...	Couch, kangaroo, and bergalia grass.	Basalt ...	Heavy black soil, verging on clay.	11·3
†67	Congo 19 ...	245	Coila and Tuross Lakes.	Parramatta, blady, and kangaroo grasses, and two kinds of tussock.	Basalt ...	Heavy black soil, verging on clay.	9·55
†68	Congo 20 ...	38	Coila and Tuross Lakes.	....	Basalt ...	Heavy black soil verging on clay.	7·5
‡69	Meringo 1 ...	3	Bega River ...	Love and blue grasses, trefoil, and herbage.	Granite ...	Dark loam, with granite subsoil.	3·3

* Breeding was carried out on all properties except these. † Holding used for wool production.

Reaction.		Calculated on soil dried at 105 deg. Cent.			Estimated carrying capacity.	Period for which grazing carried on.	Clinical evidence of deficiency, and remedial measures adopted.
Comber.	pH. Quinhydrone.	Loss on ignition.	P_2O_5 available.	CaO available.			
		Per cent.	Per cent.	Per cent.		Years.	
Acid ...	5·77	6·16	·0019	·0838	1 beast to 9 acres.	80 to 90	Osteophagia and stiff gait—Nil.
Acid ...	6·03	6·64	·0021	·1045	1 beast to 4 acres.	90	Osteophagia especially noticeable in dry times; young heifers (milkers) look ragged and tucked up; most cows in fair to good condition—Several licks of unknown composition tried, but cows said to refuse them.
Acid ...	5·74	10·93	·0058	·1777	1 beast to 4 acres.	90	As in No. 32, but this is considered better country; milking cows are kept here and dry stock on No. 32—Same as No. 32.
Acid ...	6·10	8·27	·0041	·1213	1 beast to 4 acres.	70 to 80	Osteophagia, especially in dry times; stock light-boned and ragged—Nil.
Acid ...	5·85	8·95	·0054	·1469	1 beast to 4 acres.	70 to 80	Osteophagia, especially in dry times; stock light-boned and ragged—Nil.
Acid ...	5·85	8·86	·0043	·1233	1 beast to 4 acres.	80 to 90	No indication of deficiency except in very dry times, when cattle have exhausted the better parts of the area—Nil.
Acid ...	6·17	7·62	·0022	·1662	1 beast to 5 acres.	70 to 80	Indications of deficiency marked in dry times—Rock salt given in dry times.
Acid ...	5·65	6·54	·0027	·0801	1 beast to 5 acres.	60 to 70	Osteophagia in dry times; young cows look ragged and hungry-looking; phosphatic lick taken ravenously in dry periods—Phosphatic lick used in dry times only.
Acid ...	5·85	5·31	·0018	·0640	1 beast to 5 acres.	70 to 80	Stiff gait and digestive disturbances in dry times—Cattle change about in dry times.
Acid ...	6·03	15·18	·0011	·1849	1 beast to 5 acres.	80 to 90	Osteophagia in dry times; botulism has occurred; dry cattle in fairly good condition—Bran fed extensively in dry times. Results good.
Acid ...	5·82	4·33	·0004	·0717	1 beast to 5 acres.	80 to 90	Osteophagia; stiff gait; if the grass is kept short, trouble is not so likely to occur—Stock removed for a few weeks in dry times.
Acid ...	6·06	6·27	·0035	·1342	......	70 to 80	Bone-chewing common when rabbits over-run the country; mortality probably botulism; calves seen showing distinct deficiency; winter coats hanging on; stiffness of joints; general unthriftiness—Pasture changed.
Acid ...	6·51	6·56	·0046	·1995	1 beast to 5 acres.	80	Mortality probably botulism; young stock tucked up and undeveloped—Cattle moved to better country. Licks of unknown composition used.
Acid ...	6·51	7·07	·0022	·1293	1 beast to 5	60 to 70	Osteophagia; carrion and sticks eaten—Nil.
Acid ...	6·34	6·59	·0036	·1312	1 beast to 6 acres.	70 to 80	Osteophagia and carrion-eating very marked—Lick used; composition and results unknown.
Acid ...	6·27	5·73	·0028	·1221	1 beast to 5 acres.	60 to 70	Osteophagia prevalent, especially in dry times; cattle light-framed and fine-boned—Bran fed to milking cows.
Acid ...	6·35	7·33	·0016	·1574	1 beast to 5 acres.	60 to 70	Osteophagia prevalent, especially in dry times; cattle light-framed and fine-boned—Bran fed to milking cows.
Acid ...	6·18	4·70	·0015	·1019	1 beast to 5 acres.	80 to 90	Stiff gait, digestive disturbances, and largeness of joints—Cattle changed about in dry times.
Acid ...	6·46	11·46	·0073	·3028	1 beast to 3 acres.	70 to 80	Nil.—Good shorthorn stock grown.
Very strongly acid.	5·94	7·06	·0080	·1109	1 beast to 2 acres.	80 to 90	Nil.
Acid ...	6·32	5·11	·0104	·1566	1 beast to 2 acres.	60	Nil.
Strongly acid	6·04	18·48	·0021	·3166	1 beast to 3 acres.	80 to 90	Nil.
Strongly acid	6·56	15·72	·0017	·2418	1 beast to 3 acres.	80 to 90	Nil.
Acid ...	6·35	14·98	·0020	·1050	1 sheep to acre.	80 to 90	Nil.
Acid ...	6·11	14·86	·0024	·2294	1 sheep to acre.	80 to 90	Nil.
Slightly acid	6·04	15·04	·0053	·2791	......	70 to 80	Nil.

‡ Holding used for dairying. § Holding used for dairying and sheep. ‖ Holding used for grazing.

A Discussion of the Results.

A careful study of the figures given in the preceding table shows that the percentage amount of citrate-soluble phosphoric acid is extremely low in the series of soils considered as a whole. It will be noted that out of the fifty-six soils examined, five only contained more than .007 per cent. citrate-soluble phosphoric acid. Eight soils, including the above five, contained as much as .005 per cent., while the remaining forty-eight soils averaged only .0023 per cent. of this constituent. The low percentage amounts of citrate soluble phosphoric acid found in the majority of the soils examined seems of special significance when it is remembered that approximately .01 per cent. of this constituent is generally regarded as the minimum amount required for the maintenance of fertility on cultivated soils. It is, of course, open to question whether a percentage amount as high as .01 per cent. is essential for the production of good, natural, pasture under Australian conditions, but it would appear probable that initial percentages of available phosphoric acid as low as .0015 per cent. to .0024 per cent. (see the average available, P_2O_5 in summarised data of "affected" soils—to appear in a subsequent section of this article), that is, approximately one-seventh to one-fifth this amount, unless offset by other soil conditions, are too low for the production of that type of natural pasture which is needed by highly-bred milch cattle.

With reference to the other constituents and the reaction, it will be noted that the percentage amount of citrate-soluble lime ranges from as low as .0406 per cent. in the case of Soil No. 20, to as high as .4435 per cent. in Soil No. 12. The loss on ignition shows also considerable variation, and is seen to range from as low as 2.92 per cent. in Soil No. 10 to as high as 18.48 per cent. in Soil No. 65. The reaction of the soils as a whole was found to be decidedly acid, and to range from pH 6.56 in Soil No. 66 to pH 4.31 in Soil No. 7. The latter, an alluvial silt, was found to contain .37 per cent. of water-soluble salts in which chlorine was present in an amount equivalent to .104 per cent. The relatively low percentage of citrate-soluble lime is probably due to base exchange with the excess of sodium salts present.

From the figures obtained for citrate-soluble lime in the series as a whole, it will be seen that a very fair correlation exists between the percentage amounts of this constituent and the soil reaction.

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(To be continued.)

Get Full Value for Your Sheep Skins.

L. JUDD, H.D.A., Manager, Temora Experiment Farm.

UNDOUBTEDLY a serious loss is sustained by many farmers and graziers through lack of necessary attention to sheep skins. Instead of being carefully treated, dried and marketed in the best condition and in the most profitable market, they are invariably left to dry on fences, where they are liable to damage by dogs or cats and to heavy loss in weight and condition from the action of sun and weather, and when stacked (at a later date) in the shed, treatment is not given to prevent weevil attack. When it comes to marketing, the skins are very often disposed of to the first dealer who visits the property, who invariably allows himself a liberal margin for the labour of consigning, etc., together with the usual trade profit, which extra return could well be retained by the grower.

The following procedure, adopted by Mr. B. J. Stocks, of "Linden Hills," Cunningar, in connection with the treatment and marketing of sheep skins, will not only prove interesting, but highly profitable to those who care to adopt similar methods.

The skins are removed carefully to avoid cutting or flesh being left on the pelt; they are placed in a shed immediately killing is finished, spread out, wool side down, and shortly after treated by painting with an arsenic wash to prevent damage by weevil. When reasonably dry, the skins are stacked, wool side up, piling one skin on top of another as high as the skins can with ease be stacked. The drying process being carried out in the shade, together with the stacking of the skins, results in a greater weight being retained in the skin and also a greater measure of condition and quality.

The arsenic wash is extremely cheap; enough ingredients can be purchased for 1s. 6d. to last for several years. The wash is made as follows:—Boil 1 dessertspoon full each of arsenic and washing soda in a pint of water, and add water sufficient to fill an ordinary 7 lb. treacle tin. The mixture can be painted on with a brush or swab.

The savings that can be effected by careful treatment and efficient marketing are exemplified by the following figures quoted by Mr. Stocks. A recent consignment of skins to Sydney, representing a collection made over six months and comprising skins from one-quarter wools to three-quarter wools, returned an average price per skin of 4s. 2d., after paying freight, handling and commisison charges amounting to approximately 6d. per skin. As the local price over the same period was approximately 1s. 6d. per skin, the loss owners are sustaining on sheep skins as the result of inefficient handling and marketing methods can be readily appreciated.

Consideration might well be given by branches of such organisations as the Agricultural Bureau and the Farmers' and Settlers' Association to community marketing. Skins belonging to each individual owner could be plainly branded and packed, and then the whole consignment made into bales and consigned as one bulk lot. Co-operation along these lines would undoubtedly effect a considerable saving in cartage and, particularly, in freight. Careful branding would enable each member to be credited with the proceeds of his individual produce. A State-wide move to market better quality skins must not only benefit individual producers, but materially enhance our reputation amongst oversea buyers.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Dapto (E. G. Coghlan)	Jan. 6, 7
Albion Park (H. H. Beattie)	„ 20, 21
Kiama (G. A. Somerville)	„ 25, 26
Wollongong (V. Stumbles)	Feb. 2, 3, 4
Berry (G. Gillam)	„ 10, 11
Castle Hill	„ 10, 11
Moruya (H. P. Jeffery)	„ 14, 15
Guyra	„ 14, 15
Pambula (L. K. Longhurst)	„ 15, 16
Nowra (R. King)	„ 16, 17, 18
Liverpool	„ 17, 18
Wyong	„ 17, 18
Milton (G. Prior)	„ 21, 22
Tenterfield	„ 21, 22, 23
Candelo	„ 22, 23
Uralla	„ 22, 23
Newcastle (P. Legoe)	„ 22 to 25
Gunning (G. E. Ardill)	„ 23, 24, 25
Blacktown	„ 24, 25
Kangaroo Valley (L. W. Vance)	„ 24, 25
Coonabarabran	„ 28, Mar. 1
Yass (S. C. Sleeman)	„ 28, Mar. 1
Inverell (E. A. Clarke)	„ 28, Mar. 1, 2
Bega	Mar. 1, 2
Dorrigo (A. C. Newman)	„ 1, 2
Maitland (M. A. Brown)	„ 1, 2, 3, 4
Oberon	„ 2, 3
Robertson (W. G. Jenkin)	„ 3, 4
Penrith	„ 3, 4
Queanbeyan	„ 3, 4
Binnaway	„ 7
Bowraville	„ 7, 8
Taralga (W. N. Fitzgibbons)	„ 7, 8
Glen Innes	„ 7, 8, 9
Walcha	„ 8, 9
Bombala	„ 8, 9
Cobargo	„ 8, 9
Wallamba	„ 9, 10
Nabiac (A. A. M. Clarke)	„ 9, 10
Berrima (H. Richardson)	„ 9, 10, 11
Mendooran	„ 10
Luddenham	Mar. 10, 11
Cessnock	„ 10, 11
Rydal (H. Murray)	„ 10, 11
Mudgee (T. P. Gallagher)	„ 14, 15, 16
Armidale	„ 14, 15, 16
Braidwood (H. E. Roberts)	„ 15, 16
Macksville	„ 15, 16
Cooma (G. E. Metcalfe)	„ 15, 16
Crookwell (A. G. McDonald)	„ 16, 17, 18
Bowral (E. Waine)	„ 17, 18
Parramatta	„ 17, 18
Gulgong	„ 21, 22
Bellingen (J. F. Reynolds)	„ 21, 22, 23
Tamworth	„ 21, 22, 23
Gloucester	„ 22, 23
Bomboka	„ 22, 23
Goulburn (T. Higgins)	„ 23, 24, 25
Campbelltown (R. A. Sidman)	„ 24, 25
Quirindi	„ 28, 29, 30
Camden (Chas. New)	„ 30, 31, Apl. 1
Taree (C. A. Jackson)	„ 30, 31, Apl. 1
Dungog (W. H. Green)	„ 30, 31, Apl. 1
Gunnedah (R. A. Brown)	April 4, 5, 6
Sydney Royal (G. C. Somerville)	„ 10 to 19
Kempsey (E. E. Mitchell)	„ 26, 27, 28
Gresford (A. R. Brown)	„ 28, 29
Orange (G. R. Williams)	May, 2, 3, 4
Grafton (L. C. Lawson)	„ 3 to 6
Casino (E. J. Pollock)	„ 17, 18
Tullamore (W. J. Colville)	July 26
Peak Hill (W. R. L. Crush)	Aug. 1, 2
Trundle (D. Leighton)	„ 8, 9
Condobolin (J. M. Cooney)	„ 15, 16
Bogan Gate (J. T. a'Beckett)	„ 23
Parkes (L. S. Seaborn)	„ 29, 30
Forbes (E. A. Austin)	Sept. 5, 6
Narrandera (J. D. Newth)	Oct. 3, 4
Leeton (E. C. Tweedie)	„ 10, 11

If manure is kept in heaps, the breeding of flies can be prevented by treating the heap with borax at the rate of 1 lb. of borax to 16 cubic feet of manure. It may be applied in solution or the borax sprinkled over the heap and then watered.

Soil Erosion.

Contour Drains Will Control It on Wheat Land.

[Concluded from page 908.]

L. JUDD, Manager, Temora Experiment Farm, and H. J. KELLY, Manager, Cowra Experiment Farm.

In the two sections of this article which have appeared in previous issues the authors have dealt with the damage resulting from soil erosion, its causes, and the methods of setting out, with the aid of a "level," the lines of the broad base contour drains which are recommended as the first essential in control.

In this concluding section the actual construction of the drains is described.

Marking Out the Drains.

SEVERAL methods can be employed for marking out, but the two described here will be found satisfactory. In the first one man walks along the line of pegs and collects them as he goes; whilst travelling he is in a position to see the minor variations which have to be ignored and so directs his steps

Fig. 1.—Banking up the Soil with the Grader, after two rounds with the Plough.

along the general contour line. A plough team is driven closely behind him. By this method a good line is obtained, showing a minimum of sharp variations.

The second method consists of striking out along the general contour line with a single-furrow plough, throwing the sod to the downhill side.

This method leaves a definite mark in which the front furrow wheel of a multiple plough can be run with great accuracy to the desired line. It also makes it easier to collect the pegs, which would be covered with earth if not removed prior to using the multiple plough.

Making the Drain.

The line of the exact position of the drain having been marked, the construction can be commenced; as far as possible, however, in accordance with the farm routine, drain making should be undertaken when the land is in a moist condition, since the earth will then pack better and more satisfactory work will result.

For this work the following can be used:—

1. Disc plough.
2. Disc plough in conjunction with grader or delver.
3. Mouldboard plough in conjunction with grader or delver.
4. Grader or delver alone.

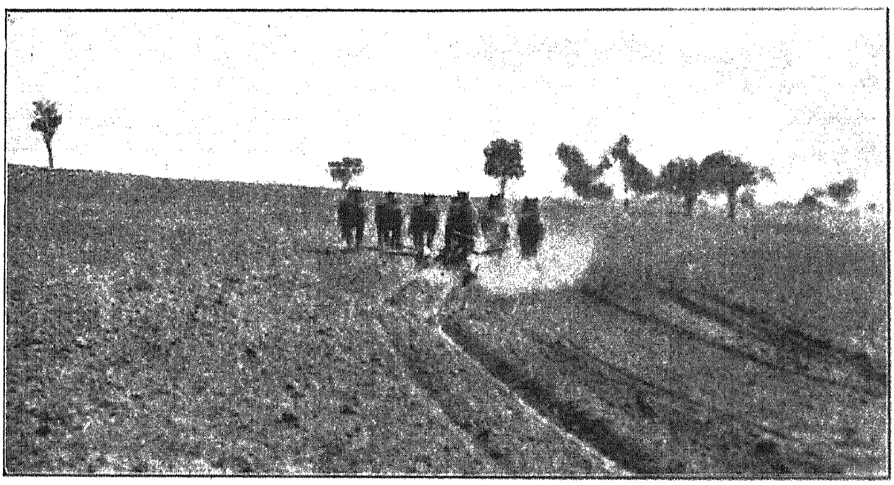


Fig. 2.—Ploughing Again After Grading.
This operation prepares more soil for grading up to give the necessary height to the bank.

The disc plough is probably the most economical of any of the above, as the one team can operate without changing, and the work is lighter than that necessary when the grader or delver is used. For contour work the disc plough is at all times preferable to the mouldboard; it throws the bank up far higher and the soil over further than the mouldboard. However, good drains have been made with each of the above implements.

If the disc plough is used alone, commence by throwing the first sod uphill, allowing the front wheel to run in the furrow left by the single-furrow plough (if that method of marking out has been used), and backing this up from the upper side, thus forming a ridge in the centre. Continue until the desired number of rounds have been backed up (with a four- or five-furrow plough), then strike out again at the centre and continue for several rounds, and then strike out again at the centre and back up for a

number of rounds. Naturally the number of rounds ploughed will vary according to the size of the bank required.

When using the grader in conjunction with the multiple plough, strike out along the contour line, banking the soil uphill, and return, banking up so that the maximum height is attained along the ridge. Plough another round and grade the earth from the top side towards the centre; repeat the ploughing and grading on the top-side until the desired height of bank and width of drain is attained. The same method is followed when using the delver as with the grader. When completed, run an additional furrow along the top side of the drain, with the rear furrow very shallow, thereby making the top side of the drain a gradual slope instead of an abrupt furrow. This last furrow also provides a certain amount of loose earth which can be worked over the bottom of the drain.

Fig. 3.—The Completed Drain.

Note the small furrows, made by the tynes, which form a lead for the water down the drain, at the same time ensuring a more or less gradual passage of water up the bank.

When the grader or delver is used alone, much the same procedure is followed as with the plough and grader used in conjunction.

To level and finish off the work after the use of any of the implements, a springtooth cultivator is worked along the drain, and also along the ploughing on either side of the bank. Besides compacting the soil and consolidating the bank, minor drains or hollows are formed in the drain itself, which in turn lead the water along the drain and tend to prevent the water rushing up the bank. In addition a certain amount of good soil is spread along the drain by the cultivator, ensuring better growth of subsequent crops.

If a paddock has been previously scoured out and deep channelling caused, it will be found when constructing the drains that low or weak places will occur at such points. These low places must receive further attention to prevent the water breaking over them and the earth scoop will

be found suitable for this work. Any severe channelling in the section treated should be ploughed and filled in with a grader in order to minimise the possibility of an excessive quantity of water coming into contact with the bank at a high velocity.

When working in badly-channelled country, a supply of straw raked up and in a handy position will be found extremely useful for aiding the passage of the team and plough over bad channels.

Where it can be done without much inconvenience, the first ploughing of the land after the drains have been constructed should be along the line of the contour, so that crossing over the drains will be avoided, but subsequent ploughings after the banks have become consolidated can be done in any direction desired.

Renovation of Banks and Drains.

Should cultural operations at any time impair the efficiency of the banks or drain, they must be attended to immediately or much damage may result. Strict attention is necessary, especially at planting time, to preserve their effectiveness.

A Home-made Delver.

At Temora Experiment Farm excellent drains have been constructed with the multiple mouldboard and a home-made delver herein described. The delver is of the reversible type, and the following materials are used in its construction:—

One piece of timber 18ft. x 12in. x 2in.
Two pieces of timber each 4ft. x 8in. x 1½in.
Two pieces of angle iron each 11ft. 6in. long.
Two pieces of angle iron each 6ft. 6in. long.
One piece of iron 4ft. 9in. long x 3in. x ⅝in.
One piece of iron 2ft. 9in. long x 3in. x ⅝in.
One piece of drag chain 6ft. long (⅜in. link).
One bottle link to fit chain.
Twenty bolts 3in. x $\frac{5}{16}$ in.
Six bolts 3½in. x ⅝in.
Four bolts 3½in. x ½in.

The 12 in. x 2 in. timber is cut into two lengths, one 11 ft. 6 in. (land piece) and the other one, 6 ft. 6 in. (wing piece). To construct the delver sketch out on the ground the shape as shown in Fig. 5, allowing 4 feet from the extreme end of the wing piece to a point 6 feet 9 inches from the front end of the land piece. Place the land piece in position on the inside of the mark, and then, holding the wing piece above and on the inside of the wing mark with the end resting on the end of the land piece as shown in Fig. 6, mark the section to be cut off the wing piece, *i.e.*, join the points A and B in Fig. 6. Cut this off and replace the wing piece in position. Now mark the land piece along the line A B and cut off to the angle.

Place the pieces in position and bolt in front with two ½-inch bolts, countersinking same.

The two pieces of 3-inch iron are then suitably bent at the ends and bolted to hold the wing in position; they also hold the stage for the driver to stand on. Care must be exercised to have the stage directly midway between the

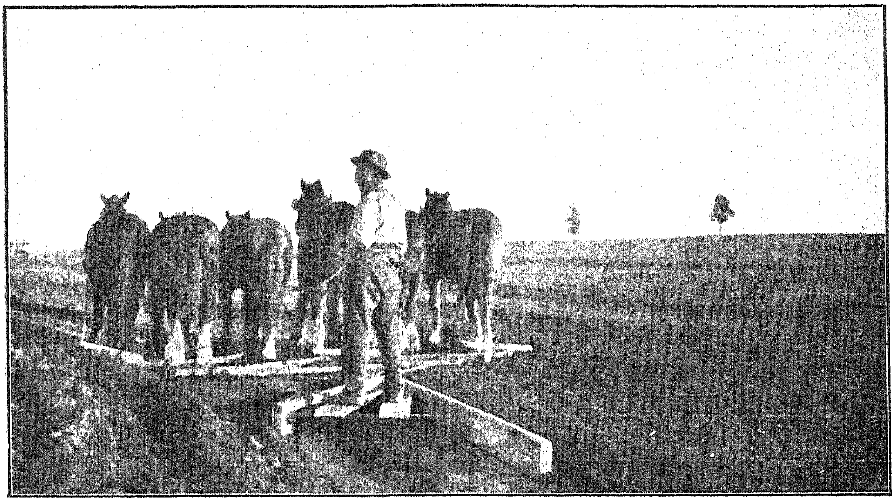


Fig. 4.—Using a Home-made Delver.
This implement is in use at Temora Experiment Farm.

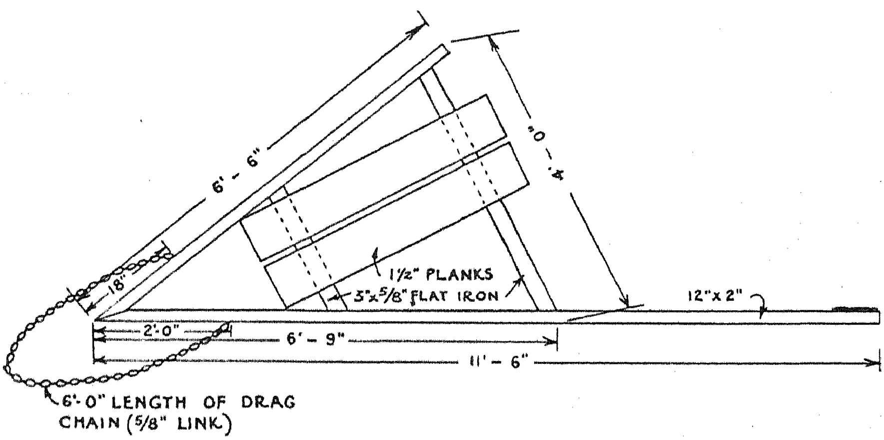


Fig. 5.—Plan of the Home-made Delver.

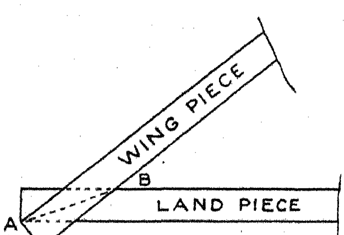


Fig. 6.—Diagram to show method of marking the cut for the mitre.

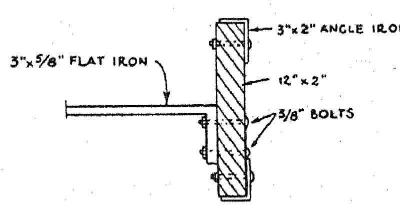


Fig. 7.—Detail of the method of fixing the iron cross stays.

top and bottom of the delver (see Fig. 7), so as to give ample clearance when the machine is turned over, as it is intended to be reversible. Bolt the stage to the iron cross pieces, place the angle iron on the top and bottom of the sides and cap the point with a piece of steel or iron to prevent damage from stones or stumps. Next bolt the drag chain in position by boring holes midway up the timber, 2 feet from the point on the land or long side, and 18 inches from the point on the wing side in a similar position. The bottle link should be placed on the chain before same is bolted in position. This link enables draught alterations to be made.

Angle iron can usually be salvaged from old drills, cultivators, etc., but if none is available, use flat iron, allowing it to protrude slightly beyond the edge of the timber on the top and bottom to protect the sides. The remainder of the iron work can be made from old scrap machines.

The delver being reversible can be worked both ways and no loss of time is experienced in working, which is a decided advantage.

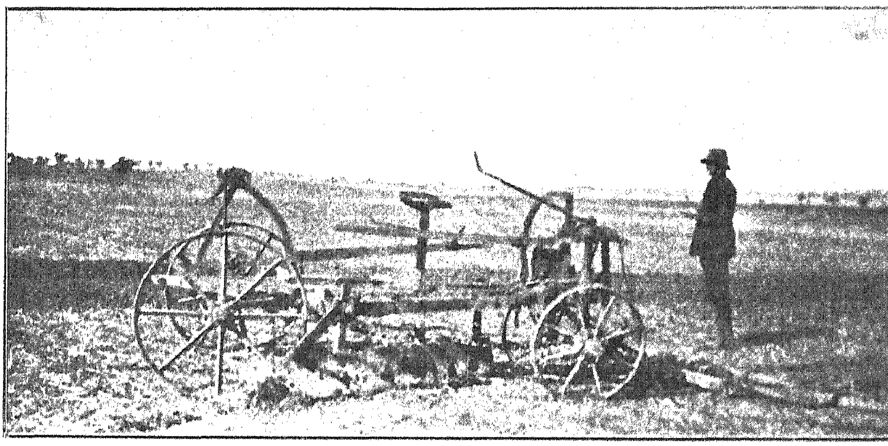


Fig. 8—A Home-made Grader.
Made from the frame of an old plough and portions of other discarded implements.

A Home-made Grader.

The home-made grader illustrated (Fig. 8) was recently constructed by Mr. E. Edwards and two members of the Marinna branch of the Agricultural Bureau. The frame consisted of an old stumpjump plough with the feet removed. The blade was made from portion of a harvester wheel straightened out, and was supported by standards taken from an old skim plough.

The machine does excellent work and the idea is worthy of imitation by others who desire to construct a home-made grader.

Success at Cowra Experiment Farm.

Judging by the results achieved in preventing soil erosion to date at Cowra Experiment Farm, thousands of acres of our best cultural land at present threatened with destruction can be saved by the early adoption of draining as outlined in this article.

The Central North Coast Tomato-growing Competition, 1932.

Extracts from the Judge's Report.

A. J. PINN, H.D.A., Special Agricultural Instructor.

JUDGING of the third annual tomato crop competition, conducted under the auspices of the Central North Coast Tomato, Fruit and Vegetable Co-operative Society Ltd., was carried out during the period 28th October to 2nd November, 1932. There were twenty-four entries, an increase of seven over last season. The competition was again divided into two sections, one for staked crops and the other for unstaked crops. Last year there were only six entries in the staked section as against fourteen this year; in the unstaked area there were ten entries this year, a reduction of one as compared with last season. The increase in entries for staked crops is a true reflection of the change which has taken place in the district in the method of cultivation. A few years ago practically the whole of the crops were cultivated by the bush method, whereas to-day wherever one goes staked and pruned crops are most largely in evidence.

The scale of points for judging was revised in order to bring the maximum points up to 100. In view of the fact that marketable tomatoes, not seed, were the main consideration, the points for purity were reduced to five, and the balance added to yield. This rearrangement of points allowed of a maximum of 45 points for visible yield and 20 points for prospective yield. "Visible yield" represents that portion of the crop already harvested plus all sound fruit on the vines from 1 ounce upward. The method adopted was to take a sequence of plants through various portions of the crop and total the weight of fruit on each vine, the average obtained being used for calculating the total. Points for prospective yield were comparative only, and calculated according to the vigour of the crop, variety, etc. It will be noted that most of the crops with small points for visible yield are well up in prospective yield. The low visible yield was due mostly to late planting, but as earliness of marketable fruit is of such importance it is only right that the score card points for judging should encourage this early production.

The Season.

The season experienced was a difficult one for tomato growers, as the winter months were particularly cold. Fortunately, dry weather conditions also prevailed, but during September there was very heavy and constant rain, falls of more than 15 inches being experienced in places. Low areas lost heavily through frost damage and flooding, but the hillside crops also suffered by washing, and the long period of wet days, combined with a saturated soil and cold nights, were ideal for the development of disease such as blight and leaf spot. It is to the credit of the growers that in the face of such conditions such excellent crops were to be seen.

The season was undoubtedly favourable to elevated areas, and it is likely that next season will see an increase in the use of such areas, of which there are ample in the district. It is, of course, necessary that provision be made for contour drains in order to prevent washing, which may do untold damage. The better air drainage and warmer soil in these positions are both conducive to earliness, but a disadvantage of such sites is the greater lift for irrigation water.

Diseases and Pests.

Whilst weather conditions favoured early and late blight, many of the growers had themselves to blame, because of their failure to adopt effective preventive methods. These fungous diseases are undoubtedly the most to be feared, and every effort should therefore be made to reduce loss to a minimum. If growers were to adopt a regular spraying programme with home-made Bordeaux during the winter and spring months, less damage would result. Too much reliance has been placed on dusts. Whilst dusts are more easily and quickly applied, and are probably quite effective for control of aphis and grub, I have not the same confidence in the dusts manufactured for control of blights. The use of home-made Bordeaux mixture would result in less expenditure to the grower, and if the mixing is carried out properly (a leaflet on the process is available from the Department) preventive treatment should be more effective than is the case when spray is made from the powders which are now largely purchased for making wet sprays. During the past season quite a number of complaints were registered in regard to burning of the plants by various Bordeaux dust specifics.

Very little Fusarium wilt was noticed in the crops, and no doubt the newness of the areas largely accounted for this. Only one plant of spotted wilt was seen and growers do not realise how fortunate the district is to be free of this trouble. Any plants showing symptoms of the disease should be immediately removed and destroyed.

Aphids were very prevalent on a few plots. Considerable yellowing of the leaves was noticeable where this pest was in evidence. The full significance of aphids as carriers of plant disease is probably not yet realised by other than a few.

Grub infestation was not as bad as in past seasons, and no doubt the increase in staking and pruning, which allows of a more effective control, is largely responsible. Arsenate of lead, either as wet spray or as a dust, is used by all growers for control, but early application for control of the first brood is often delayed too long. All the staked crops except one were kept clean of diseased and grubby fruit. Usually in the bush areas much fruit is left lying about and it is a big factor in the breeding out of later broods, to the detriment of all the growers in the district.

Irrigation and Cultivation.

There is a tendency on the part of the majority of growers to irrigate too frequently. It should be remembered that foliage diseases are encouraged by such continual wetting, and for this reason it is desirable that the

spray irrigation be carried out in weather which will ensure rapid drying. The less dense foliage of staked plants, and the greater space between them, facilitates drying, but in the case of bush plants, especially when overgrowing one another, drying is slow. Continual wetting of the soil also reduces the soil temperature, and thus in the spring months the growth of the crop is retarded. In some of the very backward areas it was noticed that growers were irrigating even though there was plenty of soil moisture to carry the crop on for a long period if cultivation were practised to conserve the moisture already there. No doubt with a little more experience application of water will be given more thought than at present. The crop should not be allowed to feel the want of water, especially when fruit is on the plants, as size may be lost and cracking of the fruit take place after the next application, but much less water could be applied during the early months unless very hot conditions rule.

Cultivation of the plot areas was very satisfactory. The rapid growth of plants in the unstaked areas does not allow a long period during which horse cultivation can be carried out, and chipping has then to be relied upon. Some of the competitors made the mistake of planting too close for ground crops.

There is no doubt that fertilisers are of great benefit in the soils of this district, and apparently all growers are aware of the need for fairly generous applications. On the basaltic soils there is not the necessity for such heavy dressings as on the lighter ones. The basaltic soils clearly indicate their greater fertility in the strength of the bushes and the sustained vigour of their growth.

Quality and Seed Selection.

The quality of the fruit throughout was of a very high standard, though some of the early set fruit in the early crops was somewhat uneven, owing chiefly to faulty pollination. There is a tendency on the part of many growers to pick their fruit too green. Much of this fruit on arrival at market has to be sacrificed, being usually kept and repacked, which means so much less to the local grower. Considering the short time which now elapses before the arrival of fruit at its destination, it should be possible to land all of it on the market with some colour in it. In view of the popularity of Break o' Day it is well that growers should note that the fruits of this variety have a light colour even while green. In other varieties, where it is intended to transport long distances, this light colour is usually taken as an indication that the fruit is in a condition for packing.

Some strains of varieties showed a number of off-type plants, indicating the necessity for selecting good type plants from which the whole of the fruit is reserved for seed. Such plants should be well marked by coloured cloth coming well down the plant so as to indicate to the pickers that no fruit is to be taken from these bushes. Visitors should also be warned not to touch plants so marked.

The Awards.

The points awarded are shown in the accompanying table. It will be noted that each section is treated separately, the plot in each which produced the highest visible yield being given maximum points for yield.

AWARDS in Central North Coast Tomato-growing Competition, 1932.

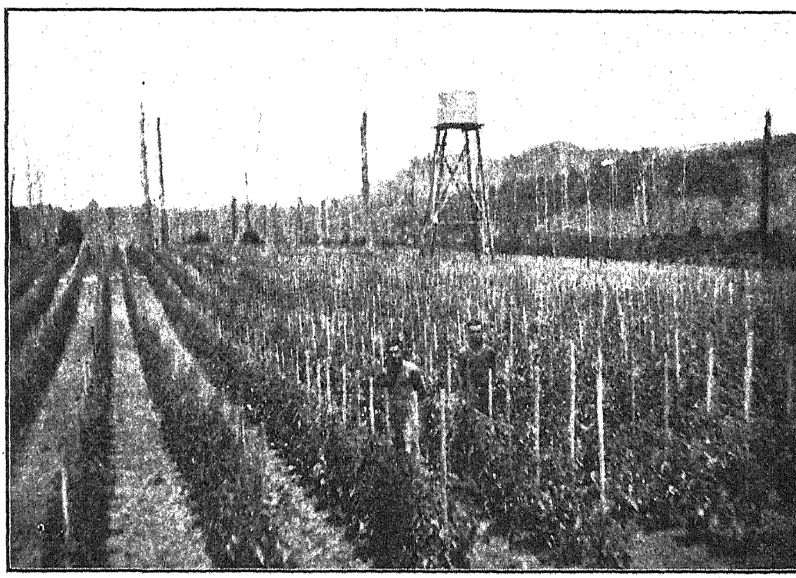
Grower.	District.	Variety.	Plants per acre.	Yield. Visible. Half-bushel cases.	Yield. Visible. Points scored (max. 45 pts.).	Yield. Prospective. Points scored (max. 20 pts.).	Quality (max., 10 pts.).	Purity (max., 5 pts.).	Cultivation (max., 10 pts.).	Freedom from diseases and pests (max., 10 pts.).	Total points (max., 100 pts.).
		Staked Section.									
Dutton Bros. ...	Boambee, Coff's Harbour.	Bonny Best ...	5,500	429	37½	18	10	5	9½	9½	89½
Carter and Carter ...	Valla	Bonny Best, Marvana.	5,500	444	39	15	10	5	10	8	87
A. E. Johnson ...	Boambee, Coff's Harbour.	Dromore, Bonny Best, Break-o'-Day	5,500	513	45	10	9½	4	10	5½	84
W. A. Robinson ...	Boambee, Coff's Harbour.	Break-o'-Day ...	5,500	358	31½	18	10	4	10	8	81½
Henderson and Pade	Valla	Marvana	5,500	435	38	12	9½	5	9	7½	81
W. M. Glass (No. 1)	Valla	Bonny Best, Earliana.	5,500	364	32	16½	9½	4½	9½	8½	80½
W. M. Glass (No. 2)..	Valla	Earliana, Bonny Best, Money Maker.	5,500	344	30	17	9	4½	10	9	79½
Henderson and Pade	Valla	Break-o'-Day ...	5,500	397	35	11	10	5	9	6½	76½
Carter and Carter ...	Valla	Bonny Best, Rapid Red.	5,500	276	24	16	10	5	10	8½	73½
J. and D. Buchanan	Valla	Bonny Best, Marvana.	5,500	187	16½	20	10	5	10	10	71½
Smith Bros. and Buchanan Bros.	Valla	Bonny Best, Break-o'-Day.	5,500	175	15½	20	10	5	10	9½	70
Smith Bros. and Buchanan Bros.	Valla	Bonny Best, Break-o'-Day.	5,500	165	14½	20	10	5	10	10	69½
E. Hamey	Boambee, Coff's Harbour.	Bonny Best ...	5,500	286	25	7	9½	4½	8	4	58
R. A. Grant ...	Boambee, Coff's Harbour.	Bonny Best ...	5,500	20	2	15	9½	4	9½	8½	48½
		Unstaked Section.									
J. K. Thompson (No. 1).	Valla	Early Winner, First and Best.	2,677	394	36	18	9	4½	9	9	85½
W. Fleming ...	Valla	Early Pride ...	3,556	490	45	10	9	5	10	5	84
F. Adler (No. 1) ...	Valla	Early Pride, Early Winner.	2,776	296	27	16	9	5	9	8½	74½
T. W. Mackney ...	Valla	Earliana, Early Winner.	3,872	237	22	20	9	5	9	9½	74½
Campbell and Mohr	Valla	Marvana	2,750	243	22½	18½	10	4½	9	9	73½
Dallimore and Macrae.	Valla	Early Pride ...	2,211	283	26	15	9	5	9	8½	72½
J. K. Thompson (No. 2).	Valla	Earliana, Break-o'-Day.	2,677	222	20½	18½	9	4½	9	9	71½
R. Franklin... ...	Valla	Early Pride ...	2,480	177	16½	16	9	5	9	9	64½
F. Adler (No. 2) ...	Valla	Early Winner ...	2,776	148	13½	17	9	5	9	9	62½
E. W. Webb ...	Valla	Bonny Best, Earliana.	4,252	88	8	18	9½	4½	9	9½	58½

The Staked Section.

The first prize in the staked section was won by Messrs. Dutton Bros., Middle Boambee Creek, Coff's Harbour. Whilst they only occupied fourth place for visible yield, the excellence of their crop gained them sufficient

points to constitute them the winners. These growers are to be congratulated on their success, which has been achieved by constant attention to every detail of the technique of tomato-growing.

The plot was situated on an elevated knoll with a gentle slope to east and west. The soil, which is of a medium loam, was first ploughed early in April 4 inches deep, ¾ ton of agricultural lime was harrowed in, and the land was rolled. It was cross-ploughed in the first week of May and again rolled and harrowed, and the same operations were repeated in June. Seed of Bonny Best was sown at the end of April and early May under cover, and the seedling plants were dusted with Bordeaux. Plants were set out in the field from 30th July and early August. Before planting, the land received a dressing of 10 cwt. per acre of a proprietary fertiliser mixture, and after



The Winning Crop in the Staked Section.
Entered by Messrs. Dalton Bros. of Coff's Harbour.

the first set of fruit a top-dressing of 160 lb. of sulphate of ammonia per acre. A further top-dressing of a mixture of 7½ cwt. superphosphate and 1½ cwt. sulphate of ammonia per acre was given at a later period. The plants were dusted when 18 inches high with a nicotine dust, and at intervals later with Bordeaux, arsenate of lead, and sulphur. Cultivation consisted of interrow cultivation and hand hoeing. The crop was of good even growth, free of disease and pests, with indications of a good prospective yield, and the fruit was of good quality.

Messrs. Carter and Carter gained second place with portion of their crop of 20,000 plants situated on hill slope and comprising a light loam. The area was first ploughed by tractor 7 inches deep in March and allowed to lie for some time before the final cross ploughing and harrowings. The plot was planted with the varieties Bonny Best and Marvana, the seed of

the former being the growers' own selection. Seed was sown on 16th and 20th May and plants were later set out into boxes and raised under cover. During the seedling stage two nicotine and several Bordeaux sprayings were given. Planting in the field took place about 18th July. The fertiliser used was 6 cwt. per acre of a mixture of 4 cwt. of blood and bone and 2 cwt. of superphosphate, subsequent top-dressings consisting of 2 cwt. per acre of this mixture, 5 cwt. of the mixture and 1 cwt. sulphate of ammonia, and sulphate of ammonia at the rate of ½ oz. per plant. During growth a spraying was given every ten days with arsenate of lead and nicotine, and in addition two sprayings with Bordeaux mixture. Frequent scufflings and hand hoeings comprised the cultivation. The heavy rain of September caused a good deal of washing and the loss of much plant-food, which no doubt was largely responsible for the less vigorous appearance in comparison with the winning plot of Messrs. Dutton Bros.

The Crop Awarded Second Prize.
Messrs. Carter and Carter's entry.

Mr. A. E. Johnson, of Boambee, Coff's Harbour, obtained third place with a hillside crop comprised chiefly of Dromore Favourite, together with some Break o' Day and Bonny Best. The first ploughing was carried out during March about 5 inches deep, followed by harrowing. The area was cross-ploughed during April and brought to the proper condition by further harrowings. Seed was sown at the stakes during early May. Two sprayings were given with Bordeaux, also two dustings with arsenate of lead and one with nicotine. The early application of fertiliser consisted of 10 cwt. per acre of half superphosphate and half bonedust, and during growth a top-dressing of 4 cwt. superphosphate and 1 cwt. sulphate of ammonia per acre

was applied. Cultivation was wholly carried out with the forked hoe and chipping hoes. This crop had the largest visible yield of fruit, but the prospective yield was lowered and points lost under the heading of freedom from disease, chiefly on account of blight. The variety Dromore Favourite made a good bottom set, and the fruit was of good size.

Many of the other areas, as the points awarded indicate, were of a very high standard, but special reference must be made to the crops of Messrs. J. and D. Buchanan and Smith Bros. and Buchanan Bros. Practically full points were awarded to these crops for cultivation, prospective yield, etc., but the lateness of planting was responsible for a small crop at time of judging and loss of points under the heading of visible yield.

The Unstaked Section.

The first prize was won by Mr. J. K. Thompson with an excellent crop of Early Winner and First and Best. The plot was situated on a hill slope on basalt soil, and in addition to a high visible yield the crop, through its vigour, also had a very high prospective yield. The area was first ploughed

Mr. J. K. Thompson's Crop.
Awarded First Prize in the Unstaked Section.

during March 4 inches deep, harrowed twice, cross-ploughed 5 inches deep and harrowed again several times. The fertiliser, a proprietary mixture, was applied in the drills and worked in with hoes, the rate of application being 6½ cwt. per acre. The plants were set out at the end of July, and received a dusting with a mixture containing copper carbonate, arsenate of lead, and sulphur. Sprayings of arsenate of lead and nicotine were given during growth in the field. Plants in this plot gave the highest average yield but the closer planting of the plot which gained second prize gave that plot the highest yield.

Mr. W. Fleming obtained second place with a crop of Early Pride grown on a basalt slope. The first ploughing was given during March at a depth

of 3 inches; the area was then disc cultivated twice, cross-ploughed 7 inches deep, and harrowed. The plants were raised under cover, and one spraying of Bordeaux was given. Seed was sown in May, and the plants were set out in the second week in August. Fertiliser consisted of 6½ cwt. per acre of a mixture of two parts superphosphate and one part of blood and bone, a top-dressing being given of 1 cwt. per acre of sulphate of ammonia when the fruits were set. This plot gave the highest yield, but the prevalence of late blight reduced the prospective yield and coupled with grub infestation lost points for the crop. Planting was too close, being 3 feet 6 inches by 3 feet 6 inches, and the plants were much overgrown and produced conditions favourable to the spread of disease.

For third prize two competitors tied. Mr. Adler's crop had the greatest visible yield, but Mr. Mackney's crop was of excellent strength and vigour and thus gained points for prospective yield.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1933 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son, Carlingford	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson, Ermington ...	2,000	2,000	700	1,000	500	6,200
Swane Bros., Ermington ...	1,000	1,000	250	500	500	3,250
Geo. McKee, Ermington ...	1,000	2,000	...	...	...	3,000
C. Langbecker, Bundaberg, Queensland	...	750	...	...	250	1,000
F. Ferguson and Son, Hurstville	2,000	3,000	...	...	...	5,000
A. T. Eyles, Rydalmere ...	3,000	2,000	...	...	...	5,000
R. Hughes, Ermington ...	500	500	250	500	1,000	2,750

—C. G. Savage, Director of Fruit Culture.

Leaf Rust of Wheat.

Observations at Glen Innes.

S. L. MACINDOE, B.Sc.Agr., Assistant Plant Breeder.

Importance of Leaf Rust.

THROUGHOUT the Australian wheat belt stem rust (*Puccinia graminis tritici*) is of considerably more importance than leaf rust (*Puccinia triticina*) in reducing yields, but in coastal areas, where wheat is grown for green fodder, leaf rust frequently causes much damage to wheat crops, and on the tablelands and slopes the quality of wheaten hay and chaff is often impaired by leaf rust, which may be the only rust present at the hay stage. The damage done to wheat crops by leaf rust is less conspicuous than that caused by stem rust. While stem rust frequently causes partial or even complete failure of the crop, farmers are sometimes of the opinion that leaf rust is of negligible importance. This is due to the fact that, under certain conditions, crops which showed an infection with leaf rust early in the season may at harvest show no appreciable reduction in plumpness of grain or yield. Carefully controlled experiments have shown, however, that leaf rust considerably reduces the water economy of the plant, rendering it less capable of utilising to advantage the available soil moisture. Thus it may depress yields out of proportion to the amount of apparent infection of the plant. In Australia, leaf rust makes its appearance more consistently than stem rust. It is frequently most abundant shortly after the stage of ear emergence. This period of the plant's growth is a very critical one, as a dry period during flowering results in a decrease in the number of grains set per ear, and in a consequent reduction in yield.

Leaf rust undoubtedly accentuates moisture deficiency in a dry spring, and much of the damage attributed by farmers to lack of moisture may be due, in part, to the influence of rust, which is prohibiting the efficient use of the soil moisture, as well as decreasing the plant's ability to elaborate food material in its rusted leaves.

In the United States of America leaf rust is of importance in the soft winter wheat belt, and to a lesser extent in the hard winter wheat areas.

The Fungus Causing Leaf Rust.

The fungus causing leaf rust of wheat is quite different from that responsible for stem rust. Both wheat rusts are distinct from those infecting oats. Leaf rust usually appears before stem rust and it attacks only the leaves and sometimes the leaf sheaths. As stem rust causes lesions on the leaves and leaf sheaths, as well as on the stem and ear, it is often necessary to make observations on the amount of leaf rust present on plants before the stem rust epidemic has made much progress.

Under the microscope, the rounded uredo or summer spores of leaf rust can be readily distinguished from the oval uredospores of stem rust. The teleuto or resting spore of leaf rust has frequently a flattened apex, while that of stem rust is rounded or pointed. In the field, leaf rust lesions can be distinguished from those of stem rust on the leaves by the irregular arrangement of the small leaf rust pustules, which never run together to form elongated pustules as do those of stem rust. The elongated black teleuto pustules of stem rust are quite different also from the small rounded and flattened teleuto pustules of leaf rust, which appear to be sunken into the unbroken leaf tissue, chiefly on the underside of the leaf.

Different Forms of Leaf Rust.

Numerous American workers have demonstrated the existence of a number of different physiologic forms of leaf rust, and Waterhouse[1] has shown that at least two different forms exist in Australia. These forms, though similar in appearance, differ in their ability to infect varieties of wheat in the seedling stage. Craigie[1] first showed that, in the case of stem rust of wheat, new forms arose by hybridisation on the barberry, but it was Waterhouse[6] who first demonstrated that different forms of leaf rust could arise with *Thalictrum* sp. as the intermediate host.

The importance, in a practical breeding programme, of physiologic forms of leaf rust, differentiated on the basis of seedling reactions in the greenhouse, has been considerably reduced with the recognition of the difference between the seedling reaction of a variety and that shown at the green fodder or hay stage in the field. Johnston and Melchers[2] have clearly shown that certain varieties which are very susceptible to leaf rust in the seedling stage are highly resistant at heading time. Mains *et al*[3] showed that in America there was evidence that even environmental factors modify the reaction of the variety Kanred to leaf rust. A comparison of field observations made at Glen Innes and on the coast indicates that, while Acme and Akrona were free from leaf rust under the epidemic conditions experienced at Glen Innes, in the three years 1929-1931, both varieties showed light infection when grown at Grafton Experiment Farm and Hawkesbury Agricultural College in 1930. Environment appears to have brought about some alteration in the reaction of these varieties to rust. Acme, at least, is reported also to be quite susceptible in the seedling stage to both Australian forms of leaf rust. This extreme difference in rust reaction is due, no doubt, in part to a difference in the reaction of the plant at various stages of growth. Other varieties, such as Ceres and Chinese White, which are quite susceptible in the seedling stage, have also a pronounced degree of resistance under varying field conditions.

Field Observations on Varieties.

Varieties have been classified on the basis of observations made for two or three years at Glen Innes and Grafton Experiment Farms, and at Hawkesbury Agricultural College. In a few instances varieties have been grouped on the basis of one year's observations only, and the grouping is

therefore only tentative. The classification of varieties has been based chiefly on the number of pustules, using a scale similar to that employed by the United States Department of Agriculture, in which 100 per cent. infection represents 37 per cent. of the actual surface of the leaf*. The size of the rust pustules was also taken into account, as resistance is frequently accompanied by a reduction in size of pustules and an increase in the amount of chlorosis or necrosis surrounding the rust pustule.

Rust-free.—Amongst the wheats which have been observed to be entirely free from leaf rust are Autel, Gaza, Hordeiform and Solid Stem Durum (durum wheats), some Beladi wheats from Egypt (thought to be of the species *T. turgidum*, Einkorn (*T. monococcum*), Hope (The Marquis-Yaroslav emmer cross of McFadden of U.S.A.), two Russian vulgare wheats (N.S.W. introduction numbers C5239 and C5247), some Marquis-Vernal emmer crosses from South Dakota (C5085, C5089, C5090, and C5084), a Vernal emmer-Iumillo cross (C5083), also from South Dakota, and Ulca (a vulgare wheat from Roumania). This group includes no wheats of economic value, as they are largely of the durum or macaroni type, but the presence in this group of Hope and the other emmer crossbreds, which are highly resistent to stem rust, is of considerable importance to the breeder, who may hope by the use of such parents to combine both leaf and stem rust resistance in the one variety of agronomic value.

A number of wheats which are of value in breeding for stem rust resistance also possess a high degree of resistance to leaf rust. Amongst these are several H44-Marquis crossbreds, H44 being a sister wheat to Hope. The H44 wheat was backcrossed with Marquis at the Dominion Rust Research Laboratory in Canada to produce rust-resistant wheats which are similar to Marquis in yield and quality of grain.

The Pentad-Marquis crosses are bread or vulgare wheats in which the leaf and stem rust resistance of the Pentad durum have been transferred by breeders at the above Laboratory to a vulgare type. Marquillo, another durum-vulgare wheat crossbred, carries some resistance to both leaf and stem rust.

Trace or Very Light Infection (5 *per cent.*).—A large number of wheats have shown only a trace of leaf rust or a very light infection. These are chiefly a number of durum varieties introduced from different countries and very late-maturing vulgare wheats mostly of European origin. The Farrer variety Thew is the only wheat of agronomic worth, and it was at one time very popular on the coast for green fodder, but as it is now rarely grown for grain in the recognised wheat districts, seed is difficult to obtain, and it has been replaced by other varieties such as Clarendon, Florence and Firbank for green fodder in coastal districts.

Light Infection (10 *per cent.*).—The best-known wheats in this class are:—

Bomen (a local variety which is now rejected on account of red grain).

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* "Field Studies on the Rust Resistance of Oat Varieties" (Levine N. M., Stakman E.C., Stanton T. R.), U.S. Dept. Agr. Tech. Bul. 143, 1930.

Cedric, Roma Red and Warchief (Queensland wheats).

Ceres (a hard red spring American wheat).

Chinese White (a wheat obtained from the Plant Breeding Institute, Cambridge, England).

Currimp, Dookie Gamma, Durity, and Brown Durity (Victorian wheats).

Dindiloa and S.H.J. (Western Australian wheats).

Hornblende and Rerraf (old varieties used by Farrer in breeding).

Kenya Crossbreds (C6040 and C6042) (crossbred wheats from Kenya Colony).

None of the above varieties are recommended for commercial culture in New South Wales. S.H.J. is an early-maturing wheat, the short straw, disease resistance and high-quality grain of which make it of some promise for grain in the western districts. The Kenya crossbreds are also resistant to stem rust, and are therefore valuable as parents in breeding for resistance to both stem and leaf rusts.

Moderate Infection (25 *per cent.*).—The following well-known varieties show a moderate infection to leaf rust:—

Burrill, Canimbla, Cedar, Clarendon, Florence, Firbank, Genoa, Jonathan and Warren (New South Wales wheats).

Cowman, Cowhort, Fedtal, Flamen, Minflor, Wardfir and Whillan (Victorian wheats).

Geeralying, Nabawa and Sutton (wheats of Western Australian origin).

Pusa 4 (the well-known Indian wheat grown largely in Queensland and to some extent in New South Wales).

Heavy Infection (40 *per cent.*).—The following Australian varieties are in this class:—Apollo, Aussie, Baringa, Barwang, Beewar, Bordan, Bunyip, Brown Currawa, Brown Minister, Cleveland, Cookapoi, Dan, Dookie Beta, Ford, Gluford, Gluyas Early, Gular, Gullen, Garra, Linden, Lambert, Major, Pacific, Pilot, Rymer, R.I.P., Silver Bart, Sunset, Turvey, Yetna.

Very Heavy Infection (65 *per cent.*).—Amongst this class are to be found the following Australian wheats:—Bald Early, Bena, Benchubbin, Bobin, Bredford, Canberra, Caliph, Currawa, College Purple, Confederation, Dundee, Duri, Early Bird, Exquisite, Fedilla, Gallipoli, Ghurka, Gresley, Late Gluyas, Onas, Penny, Riverina, Sultan, Sword, Sands, Three Seas, Waratah, Yandilla King, Zealand.

Extra Heavy Infection (100 *per cent.*).—The greatest degree of susceptibility to leaf rust is reached in this group, which includes the following well-known varieties:—Baldmin, Bogan, Bunge, Carrabin, Dart's Imperial, Droophead, Federation, Flora, Florida, Hard Federation, Marshall's No. 3 Minflos, Nizam, Nolba, Novo, Patriot, Petatz Surprise, President, Queen Fan, Ranee, Rajah, Union, Wandilla, Waterman.

Breeding Leaf Rust Resistant Varieties.

Because of the greater importance of stem rust in most countries, the breeding of wheats resistant to leaf rust has not made the same progress as breeding for stem rust resistance. Mains *et al*[4] in America studied the inheritance of resistance to leaf rust in numerous crosses, both at the seedling stage in the greenhouse and under field conditions. Because of the greater ease in interpreting data, genetic studies were made chiefly with the use of known physiologic forms in the greenhouse. At the present time in America some fundamental work is also being undertaken along these lines, but the major economic programmes of breeding wheats resistant to leaf rust are being undertaken under field conditions.

At Glen Innes, special precautions are taken to ensure a severe rust epidemic by early planting of early-maturing, rust-susceptible border rows which are inoculated in the spring with spores of both leaf and stem rust. Fortunately, the emmer crossbreds such as Hope and the related strains H44 x Marquis and also the durum derivatives Pentad x Marquis and Marquillo appear to be the most desirable parents to use in breeding for high resistance to leaf rust. As the same varieties are very desirable parents in the programme of breeding for resistance to stem rust, advantage can be taken of the rust nursery at Glen Innes to select for resistance to both rusts within the same crossbreds. As lines are fixed for resistance to leaf rust, and, when possible, also to stem rust, they will be distributed to coastal Experiment Farms, where some additional selection for leaf rust resistance is also being undertaken.

In conclusion, acknowledgment is made of the co-operation of Mr. W. H. Darragh and Mr. N. S. Shirlow, who made available data on the reactions of varieties to leaf rust under coastal conditions.

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Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Bobin	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
Duri	Manager, Experiment Farm, Condobolin.
Free Gallipoli	Manager, Experiment Farm, Temora.
Nabawa	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
Waratah	Manager, Experiment Farm, Temora.
Yandilla King	Manager, Experiment Farm, Temora.

Oats—

Algerian	Manager, Experiment Farm, Bathurst.
Belar	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Temora.
Gidgee	Manager, Experiment Farm, Temora.
Guyra	Manager, Experiment Farm, Bathurst.
White Tartarian ...	Manager, Experiment Farm, Bathurst.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

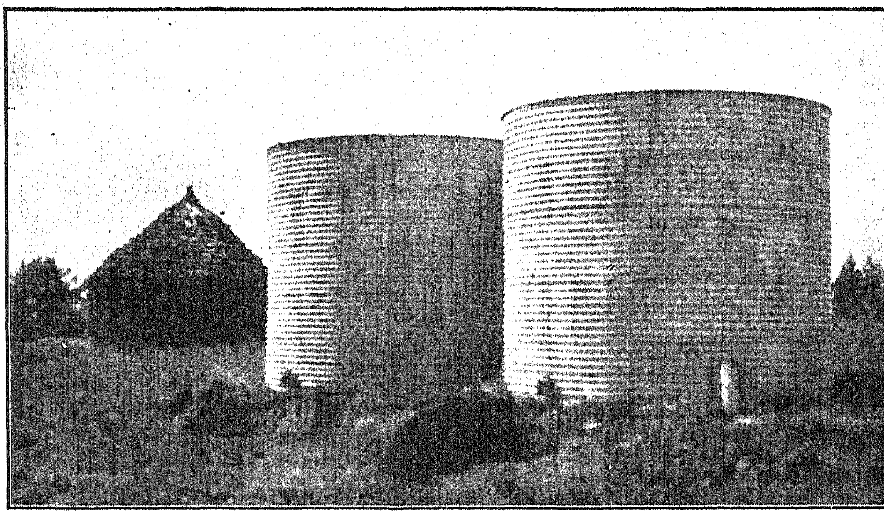
Concession Railway Freight on Agricultural Seeds.

Following upon representations of the Agricultural Bureau, the Transport Commissioners have reviewed the question of freight on agricultural seeds. Concessions have hitherto been granted under certain conditions for seed wheat and potatoes, but agricultural and vegetable seeds generally are now covered by the concession. Previously, unless the consignment was one of departmentally inspected pure seed and was accompanied by a departmental certificate to the local stationmaster to the effect that it was solely for seed purposes, it was necessary for the consignee to furnish a declaration that the seed had been actually sown before the sender could claim the concession (in the form, therefore, of a rebate). It is now only necessary, however, for the latter to declare on the consignment note that the article is for seed purposes only and the concession will be allowed at the time the seed is conveyed.

The Uses of Maize.

L. S. HARRISON, Special Agricultural Instructor.

MAIZE has long been regarded as one of the most important crops that may be grown in this State, and where rainfall and climatic conditions are suitable and the land sufficiently fertile, a high average return may be anticipated. It is necessary, however, that close attention be paid to cultural treatment, choice of varieties and seed selection. The acreage under the crop in New South Wales has shown little variation for many years, and though recently there has been a tendency towards a reduction, it is considered that where the three essentials enumerated above are practised the production of maize should be increased. Should such a considerable increase in the crop occur, growers could not expect a continuance of this



Maize Storage Tanks in New England.

season's high prices, but that factor should not influence the advisability of increasing the production.

The chief use of maize should be feeding on the farm, and where this is recognised as a sound practice, the production of the crop will receive added attention. Admittedly some areas are particularly suited to large scale production, and frequently on that account at a smaller cost per bushel, so that they are enabled to place supplies on the open market at a lower figure than is possible to the grower not so situated. Unfortunately, however, the open market is distinctly limited and uncertain—prices fluctuate between a wide range and the demand is insufficiently stable to ensure growers an adequate return. However, as maize consumption increases with the realisation of its advantages, so will maize growers be able to keep step, as the

present approximate annual yield of four million bushels can very readily be increased. Storage of inland-grown maize must ultimately be arranged —to distribute supplies throughout the year, to maintain a reserve of surplus grain for lean seasons, and to form a system of stock insurance against great shortage in times of drought.

The Food Value of Maize.

The following brief table is of interest, since it shows the chemical composition of maize in comparison with other widely used foodstuffs. The high carbohydrate, and the comparatively low protein content is apparent. This denotes the necessity for some addition to the protein content by other fodders to increase the value of each; the lime-content of maize is also somewhat low.

Analyses of Maize, Wheat, and Oats.

Grain.	Water.	Ash.	Albumenoids.	Fibre.	Carbo-hydrates.	Crude Fat.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Maize	12·3	1·3	10·8	1·5	69·8	4·3
Wheat	13·7	1·5	8·7	2·4	72·8	·9
Oats	10·9	3·3	8·5	11·8	60·6	4·9

The albumenoids are of greatest importance as food constituents, and thus the degree to which they occur is indicative of the relative value of the material. Protein is the chief ingredient in the albumenoids, and its function is to supply flesh and muscle and replace waste tissue. The carbohydrates, largely composed of starch and sugar, supply heat and muscular energy and assist in balancing the protein, enabling it to work more efficiently. It has been estimated that one bushel of maize contains approximately: Starch, 36 lb.; gluten meal, 7 lb.; corn bran, 5 lb.; germ oil meal, 2.7 lb.; and corn oil, 1.8 lb.

In amount of food production per acre, maize outyields all other crops. For all kinds of stock the grain is one of the best feeds. The high oil content of the grain, together with its digestibility—a very important factor—increases its value. Maize both yellow and white is fairly rich in Vitamin B, while yellow maize contains, in addition, Vitamin A. This however need not be considered, because green leaves contain the Vitamin A, and in practically every case maize is fed in conjunction with leaves in some form.

Fortunately, it is not necessary for us entirely to stall or hand feed stock over long periods, and thus the enormous consumption of maize grain necessary in those countries less favourably situated in this regard, does not occur here. Maize is very satisfactory as a commodity for reserve and storage, and although susceptible to insect damage, this disability is easily overcome; for storage purposes it is necessary that the grain should be dry (not containing more than 14 per cent. of moisture) and that the container should be airtight. In addition to farm storage, it may occur that some co-operative system will be evolved, whereby in times of heavy supply, the surplus may be retained at a price covering the cost of production until a greater need arises.

Maize Grain for Pigs.

Maize grain for stock feeding purposes has received its greatest recognition and use to date as a pig food, and for this it is of exceptional value, providing an ideal ingredient in the ration from a general farming standpoint. It is advisable to feed it in conjunction with other foods such as skim milk or others which are richer in protein, in an endeavour to balance the ration as far as possible, as by this means the greatest value of each ingredient is made available to the animal. Consideration must be given on each individual area to the availability of additional food supplies. This is a point of considerable importance and must be watched at all times by the stock feeder. The purchase of foodstuffs is to be deprecated if it is at all possible to produce a close equivalent on the farm. Maize, as the main constituent of the food supply, must be fed with some greenstuff—preferably leguminous—to provide a better balance.

Pigs Grazing Standing Maize on the Hunter.

It has been estimated that approximately 9 bushels of maize grain are required to produce 100 lb. of pork, and when the grain is balanced with some other food which suits the area—skim milk, lucerne or some succulent greenstuff—this figure will be substantiated without difficulty. If pork is valued at 4½d. per lb., maize used for pig feeding will have a value of 4s. 2d. per bushel; this figure is worth close attention, as costs of handling and marketing the grain are not a charge against it, and the necessary complementary foodstuffs can be produced readily enough in most cases. When pigs are grazed on standing maize crops, they must have access to lucerne or grass, or failing this a fair growth of greenstuff should be left in the maize paddock. The growth of a leguminous crop such as cowpeas, with the maize, is the ideal practice. The legume should be planted at the time of the last maize cultivation so that it will be approaching maturity when the maize is fit to be fed off.

Maize as a Fodder for Dairy Cows.

As a fodder for dairy cows green maize stalks must be regarded as of high value since they assist materially towards continuity of output through the winter months. Our climatic conditions tend to limit production then, and also during dry summer periods, and action may frequently be taken to curtail the severity of the loss through the agency of maize. Silos of any type are suitable for maize, which is the most suitable crop for ensilage on the grounds of quantity per acre and succulence. The use of maize silage is receiving increased attention and lately has had quite a lot of well-merited publicity.

In cooler climates dry maize fodder is found of much value for winter use and provides a very necessary roughage. Maize grain, added to the dairy ration has proved highly beneficial and a recommendation is as follows:—4 parts ground maize, 4 parts ground oats and 1 part bran, added to the bulk. Maize meal may also be added to skim milk for calf feeding, the two foodstuffs making an excellent combination.

Its Value for Other Livestock.

The poultry farmer looks to maize to supply a large quantity of foodstuffs for his birds, and the grain is used very extensively. It is estimated that approximately one million bushels annually, almost entirely yellow grain, are utilised for poultry purposes. Because of its use as the grain ration for general feeding, its ability to enrich the yolk colour, the added fertility of the eggs and increased strength of the chicks on hatching, and its utility as an excellent base for chick foods, maize is of much importance to the poultryman.

For horses maize is excellent for maintaining stamina and condition, and its recognised value for this purpose does not require extended reference here. In times of drought and when sheep are hand fed, maize grain is outstanding from the points of view of feeding value and convenience. About 4 oz. a day per head is sufficient to wholly maintain life in dry periods, and the ease with which the grain is spread and the sheep pick it up, are important features. The grain is particularly suited to use with sheep in this way, and sheep feeding could thus provide a valuable outlet for it.

Some Other Uses of Maize.

Maize has long been recognised as useful for human consumption, and in some countries the amount used in the form of maize meal is high; in Australia, however, this is not the case, partly because the meal is liable to weevil infestation and in addition 100 per cent. maize meal has a limited period during which it keeps fresh. The increased use of maize meal in this way is strongly recommended, both as a porridge substitute for winter use and as one of the ingredients in scones and other mixtures of a similar nature. Maize meal will not rise in the same way as wheaten flour and should only be used in conjunction with it. As corn flakes maize is well known and this industry is responsible for the utilisation of large quantities. Cornflour has a regular place in the human diet and is regarded as a necessity in some forms of cooking.

Sweet corn is regarded by many as a luxury, but before long it is probable that the increased attention to the marketing of this crop, both as cobs and in the tinned form, will cause a large increase in the available supplies. It is satisfactory to note a better demand for this very excellent line. Pop corn is showing a little revival, and it is of sufficient importance to compel attention being paid to it.

Of other products of maize, corn starch is probably the best known. This is made in large quantities from maize and a by-product from it is gluten feed, a valuable stock fodder rich in protein. Of course, cornflour is largely composed of starch. Glucose, or maize syrup, largely utilised in confectionery manufacture, is another by-product of maize of considerable value.

Corn oil is used as a culinary oil in large quantities. For distilling purposes a considerable amount of maize is utilised, chiefly for whisky and gin production, and there are many other small sideline products from maize, but they are of little significance to us at present.

Protect Your Haystacks.

That one of the most common sources of leakage of farm profits is the excessive depreciation of hay stored both for current requirements and as a drought reserve was pointed out recently by Mr. L. Judd, Manager of Temora Experiment Farm, to a gathering of farmers. It should be realised that every ton of fodder ruined is not only a direct loss of the cost of growing and storing, but also a loss of revenue equal to the difference between the cost of production and the sale value of the fodder.

When storing hay for current use a hay shed will be found most profitable. Time and expense are saved at harvest by the speed with which the hay can be stacked, and when feeding out the produce is at all times protected from the weather. Expense in making the shed mouse-proof will be amply repaid. All stacks should be built on mouse-proof straddles and roofed down with either iron or thatch.

Useful leaflets on hay straddles and thatching haystacks may be obtained free on application to the Under-Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

Continuous Grazing of Lucerne Pasture is Detrimental.

For normal development a plant must have a certain amount of leaf surface for the conversion into available plant food of the mineral solutions absorbed from the soil by the roots, and because it interferes with this process, heavy continuous grazing is seriously harmful to lucerne. The correct method of handling the paddocks is to wait until the growth is approaching the bud or early flowering stage and then feed it off rapidly by stocking the area heavily. It is advisable to have reasonably small paddocks, and to put large numbers of sheep on at a time to eat the area off in at least ten or twelve days. If the paddocks are large, temporary fences that can be erected rapidly and moved easily should be utilised for the purpose of subdivision.

Orchard Notes.

JANUARY.

C. G. SAVAGE and W. LE GAY BRERETON.

The Drying of Sultanas.

THE drying season for sultanas is approaching, and growers are reminded of the "mixed dip" that was successfully used last season by sultana growers, not only in this State, but also in Victoria and South Australia. Full directions for preparing and using this dip can be obtained in printed form, free, from the New South Wales Department of Agriculture, Box 36A, G.P.O., Sydney, and all sultana growers who have not this leaflet are advised to send for a copy at once, for there is nothing like having printed directions for reference at any moment.

This dip is the result of investigations carried out by officers of the Council for Scientific and Industrial Research and the Departments of Agriculture in New South Wales, Victoria, and South Australia, and was designed to overcome the great disadvantage of the cold dip, *i.e.*, a protracted drying period, and to obtain a lighter and more uniform colour than could generally be obtained from the hot, caustic soda dip.

Some Points to be Observed.

There are a few points in the preparation and use of the mixed dip which are worth drawing attention to in these Notes.

The dip is made by first dissolving 2½ lb. potassium carbonate in 50 gallons of water in which 1½ pints of olive oil are thoroughly emulsified; then add 1½ lb. caustic soda, and heat to 180 deg. Fahr. Test by dipping a few sultanas, and if the berries do not show a few very slight cracks, add ¼ lb. of caustic soda and try a fresh lot of sultanas; repeat this until a point is reached at which slight cracking occurs on some of the berries, and then dipping may proceed.

Remember that the dipping should be a quick, in-and-out operation, and the dip should be kept at between 177 and 183 deg. Fahr. whilst dipping, and should not be allowed to rise above 183 deg. when not in use.

Make all necessary additions to the dip, which is reduced in volume during use, by adding from a stock solution of the carbonate of potash and olive oil solution described above. It is convenient to have a stock solution ready and kept in a separate tank or other receptacle ready for replenishing the dip as required. The addition of the potassium carbonate and olive oil solution to make up the volume of the dip will generally necessitate the addition of caustic soda to bring the dip to the correct state at which slight cracking of the fruit occurs. This should be arrived at by trial, as when

first preparing the dip, adding only ¼ lb. caustic soda at a time till the correct slight cracking of some of the berries is produced with the dip at between 177 and 183 deg. Fahr.

Never Add Water Alone.

Should the dip become too concentrated, which condition is shown by an over or too severe cracking of the fruit, it should then be weakened by adding more of the potassium carbonate and olive oil stock solution. It should be definitely understood that neither the weakening of the mixed dip nor making up its volume should be attempted by the adding of water alone.

It should also be noted that the quantity of caustic soda used to produce the slight cracking of the fruit is regulated according to the condition of the fruit. This is necessary, just as it was with the old hot caustic dip, and as the fruit is likely to vary, the dipper should keep an eye on the fruit as it comes from the dip and vary the dip to suit the fruit when necessary.

Care should be taken to spread the dipped fruit evenly on the racks and not too thickly, or drying will be retarded. The fruit should be protected from the direct rays of the sun by hessian hung on the sunny side of the racks. During rainy weather drying can be hastened and darkening of the fruit lessened by spraying the fruit with a solution of 4 lb. carbonate of potash to 8 gallons of water in which is emulsified half a cup of olive oil.

The fruit should be left on the rack till thoroughly dry, or crushing of berries will occur, causing stickiness and darkening of colour. The dried fruit should be shaken from the rack in the morning and spread thinly on hessian as soon as possible and exposed to the sun to even up the colour. An application of the spray mentioned above when the fruit is spread on the hessian will hasten the colouring by the sun.

In the early days of sultana growing in Australia it was the practice to leave the picking of the fruit till late in the season in order to obtain very mature fruit and high sugar content. Undoubtedly extra weight was gained in this way, and perhaps a more fleshy dried fruit, but it delayed the drying of the latter part of the crop till very late, and there was greater liability of running into bad weather. Hence the practice now is to commence drying somewhat earlier, thus securing a better chance of producing a more uniform product right through the drying season. However, care must be taken not to run to the other extreme and to attempt picking whilst the fruit is immature, or a poor sample, lacking in flesh will result. As a rule, picking should not be commenced till the juice has reached at least 12 deg. Baume.

Pest Control.

Codling Moth.—Care should be taken to continue the sprays of lead arsenate for codling moth in apples and pears. At the same time other methods of control, such as frequent inspection of the bandages and collection and destruction of infested fruit should not be neglected.

Fruit-fly.—In areas liable to fruit-fly the frequent collection and destruction of infested fruit should be continued, and either the poison bait spray used or traps kept replenished with lure.

Inspect Codling Moth Bandages Frequently.

Citrus Scale.—January is the commencement of the season for dealing with red scale either by fumigation or spraying. Free leaflets can be obtained from the Department of Agriculture on the control of citrus scale, and also of the fruit-fly and codling moth.

Cultivation.

It is often the practice to neglect the cultivation of trees, such as apricots, cherries, and early peaches, which crop early in the season, as soon as the fruit is picked. This is not good orcharding, for the trees require to be kept in good condition to develop their fruit buds for the next season's crop.

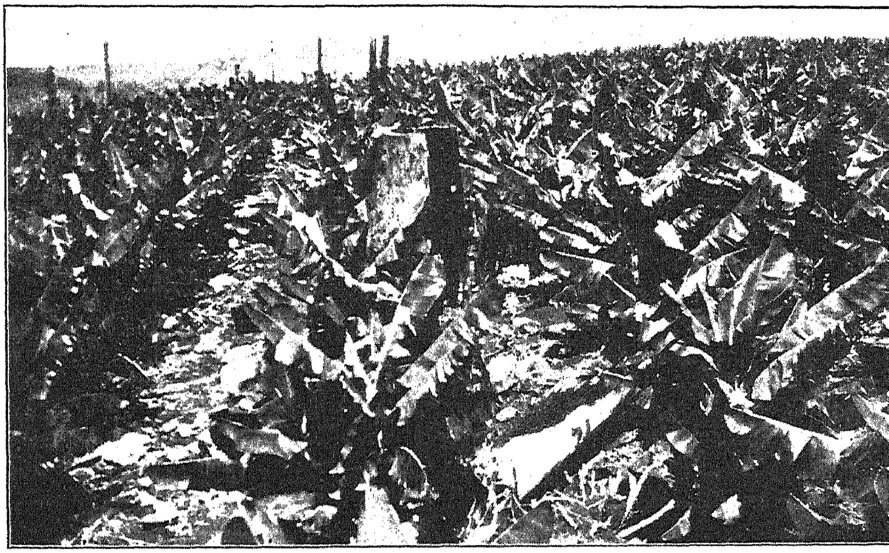
The very frequent use of the orchard cultivator is apt to make the surface soil too fine and form a sole pan very close to the surface. It is partly for this reason that greater use of the plough and less frequent use of the cultivator is advocated, and late in December or early in January is generally a good time to get in one of these summer ploughings. Often, by that time, there are weeds that have been too much for the cultivator and which the plough will eradicate. The plough will also break through the cultivator-pan and leave the land so that it will more readily absorb any rain that falls or irrigation water that is applied. Moreover, the plough leaves a more lasting soil mulch than the cultivator.

Planting Bananas on Contour Lines.

Messrs. J. G. Ord and Lane have made a departure from the usual method of planting bananas "on the square" by putting their plants in on contour lines. These two newcomers to the banana-growing industry in New South Wales are located near Dunbible, some 8 or 9 miles south of Murwillumbah, and the results of their method of planting will be watched with interest, as they contend that it possesses many advantages over the commonly adopted system of planting on the square. In the first place, they claim that although they maintain the desired distance between the plants they are

able, by planting on contours, to get considerably more plants to the acre. But what they regard as the best feature of contour planting is its control of soil washing—a very important factor on the steep hillsides on which bananas do best. When a plantation is planted on the contour, the stools in one row mostly come opposite the spaces in the rows above and below, so that the great rush of water so usual during heavy downpours has not the unimpeded passage downhill that is afforded it when the plants are put in on the square.

Messrs. Ord and Lane have had long experience in the planting of rubber in the Federated Malay States, and their experiences in that industry have taught them the advantages of contour planting as opposed to any other system.



Bananas Planted "on the Square."

Grading and Packing Bananas.

Mr. H. W. Eastwood, Senior Fruit Instructor, has supplied the following notes on the grading and packing of bananas:—

At frequent intervals the grading regulations regarding the packing of bananas—which have now been in force for a lengthy period—have been brought under the notice of growers, but there are many cases where growers are not complying with the standards laid down. If only the growers who adopted or persisted in such neglect were affected, that would be bad enough, but unfortunately more serious consequences than those to the individual result.

Periodically exception is taken by those in the trade and also by the general public to the placing on the market of inferior fruit, to irregularities in grading, and to the incorrect branding of cases—faults which cannot be denied, and which hinder the sale of good and inferior fruit alike.

One of the problems facing banana growers to-day is how to increase consumption to help absorb the prospective increase in production. To achieve this objective the first essential is to establish a standard which can be maintained throughout the year, and the standard is set by the grading regulations. Any marked irregularities in sizing and grading or in quality and get-up will make the fruit more difficult to dispose of. Every effort should be made by growers individually and collectively to counteract these failings.

It can be assumed that Fiji will only export to this country the best grade and quality fruit, owing to the limited quantity allowed in, and to meet this class of competition growers will need to size and grade their fruit faithfully and to pack and brand it honestly, properly, and attractively.

Where Extra Skill is Required in Packing.

Even where the banana is sized as accurately as is humanly possible by hand and eye, the fruit in the grade can vary a good deal in shape, curve, and fullness. This factor in the grading of bananas requires extra skill on the part of the packer to make use of the irregular-shaped bananas to the best possible advantage. Fairly straight fruit is handy next to the ends of the case in commencing and finishing off rows, especially so in the bottom layer, and also in the centres of the pack. Nicely curved bananas can be used to good advantage in the last few layers in finishing off the case. As packing proceeds it will be found that particular shapes and curves will fit snugly into openings or positions that constantly occur.

Packing is now done in "singles," and whichever style of this class of pack is used the fruit should always be carefully placed in the case and packed tightly and neatly. The fruit in the rows should touch the sides and ends of the cases and be keyed in position by the end fruit in each row. Open centres in the pack should be closely and firmly filled with the same grade of fruit in order to keep the rows in position and the fruit flush with the sides and ends of the case before commencing the next layer.

As the carrying qualities of bananas are affected by the heat during the summer months, growers should not allow the fruit to become "over full" before cutting, and no fruit which is likely to colour during transit should be packed.

Paper on the bottom and top of the case is all that is necessary during the summer period.

Canada's Wheat Position.

According to the Canadian Bureau of Statistics, the Dominion's 1932 wheat crop is estimated at 467,150,000 bushels, which will be 163,000,000 bushels more than was gathered in 1931.

During the twelve months August-July, 1931-32, Canada exported 182,800,000 bushels of wheat as against 228,480,000 bushels for the corresponding period in the previous year. Great Britain was the principal importer, with 101,560,000 bushels.

Processing of Prunes.

Results of Departmental Experiments.

C. G. SAVAGE, Director of Fruit Culture, W. LE GAY BRERETON, Chief Fruit Instructor, and J. C. ALLISON, Orchardist, Wagga Experiment Farm.

THE first attempt made by the Department to produce a dessert prune was carried out by the late Mr. S. A. Hogg over thirty years ago, when Orchardist at Wagga Experiment Farm. Mr. Hogg succeeded in producing processed prunes satisfactory in flesh, texture, flavour and external appearance; his product met with the approval of the consumer at the time and orders were executed for one of the leading hotels of Sydney. The taste of the consumer has changed, however, and a dessert prune with a tender skin is now demanded. It was for this reason that trials in the processing of dessert prunes were commenced in 1928.

The 1928 Experiments.

The 1928 experiments were conducted at Yanco Experiment Farm orchard with d'Agen and Robe de Sergeant prunes as they came from the sweat boxes or lugs after completion of drying, and were as follows:—

A.—D'Agen and Robe de Sergeant prunes rinsed in cold water, packed wet into cans and cooked in steam retort at 5 lb. pressure for periods varying from ten to sixty minutes in gradations of ten minutes.

B.—D'Agen and Robe de Sergeant prunes packed dry as they came from the sweat boxes into cans and cooked in a similar manner to A.

C.—A process supplied by Mr. J. Brady, Manager, Leeton Cannery. Robe de Sergeant only treated. Prunes as they came from the sweat boxes rinsed in cold water, sweated seven days (cold wet sweat), dipped in boiling water two and a half minutes, packed hot into cans, sealed and cooked for sixty minutes at 212 degrees Fahr.

D.—D'Agen and Robe de Sergeant rinsed in cold water, exposed direct to steam at 5 lb. pressure for periods of two, four, and six minutes. The prunes from this process were wrapped in glassine paper, packed in cartons and cartons covered with cellophane.

E.—D'Agen and Robe de Sergeant dipped in boiling water for three minutes, sweated forty-eight hours, and then steamed for five minutes under pressure (some at 5 lb. pressure, some at 8 lb.), and packed in cartons as in D.

The exposure of the prunes direct to steam under pressure was suggested by the first mentioned of the authors.

The results on examination four months after processing were as follows:—

Cans (Processes A, B, and C).—Of the prunes packed in cans, those treated by process C (Leeton Cannery) were the best. Those treated by

process A (packed wet) were superior to those from B (packed dry). Cooking for sixty minutes resulted in samples superior to those cooked for the shorter periods. Though the flesh, texture, flavour and external appearance of prunes from C process and the sixty minute period of A process were satisfactory, however, the skins were still too tough.

Cartons (Processes D and E).—It should be noted that these were not examined until four months after processing. Later tests have shown that the skin of processed prunes may appreciably toughen again three days after packing in a carton, and eventually will revert to almost if not quite its original condition before processing. Hence, it is not surprising that the skins of prunes from processes D and E were all found to be tough. Of the prunes treated by process D, those steamed for six minutes were superior in flesh, texture, and flavour to those steamed for four minutes. E processed prunes steamed at 5 lb. pressure appeared similar to those treated by D process steamed for four minutes. Of the E process prunes, those steamed at 8 lb. pressure appeared slightly superior to those steamed at 5 lb. pressure.

The 1929 Experiments.

The 1929 and subsequent experiments were carried out at Wagga Experiment Farm orchard, and included the following:—

1. The periods of cooking in process A of 1928 at 5 lb. pressure were extended to 120 minutes in gradations of fifteen minutes.

2. A duplication of No. 1 to a period of ninety minutes at 10 lb. pressure.

3. Process C of 1928 (Leeton Cannery process) was repeated, the period of cooking being extended to 120 minutes in gradations of fifteen minutes.

4. Prunes were dipped in boiling water for two and a half minutes then sweated for seven days, packed in cans and cooked in a boiling cooking bath for periods varying from sixty to 120 minutes in gradations of fifteen minutes.

5. Prunes prepared as for No. 4, then packed and cooked in steam at 5 lb. pressure for periods varying from sixty to 105 minutes in gradations of fifteen minutes.

6. Repetition of No. 5, but time extended to 120 minutes and pressure at 10 lb.

7. Prunes exposed direct to steam at 5 lb. pressure for periods of six, ten, and fifteen minutes, then packed in cartons.

8. Similar to No. 7, except that steam was at 10 lb. pressure, then packed in cartons.

9. Prunes dipped in boiling water for two and a half minutes, sweated for seven days, and then steamed and packed as in No. 7.

10. Prunes dipped and sweated as in No. 9, and then steamed and packed as in No. 8.

The products were examined three months after processing by a representative gathering of processors and distributors of prunes. The prunes in Nos. 1 to 6 were in each case of good appearance, but there appeared very little difference in the texture of the skin between those exposed to 5 lb. and those to 10 lb. steam pressure. The extension of the period of cooking after packing rendered the skin only slightly more tender, and excessive cooking 105 minutes and over was liable to give an over-caramelised flavour. Moreover, it was considered that periods of over seventy-five minutes cooking would be impracticable as a cannery practice. Dipping in boiling water before sweating, as tried in Nos. 4 to 6, had no influence in rendering the skin more tender, as the skin hardens as the prune cools when exposed to the air. It was considered that No. 3 (Leeton Cannery process) gave the most satisfactory result. Of lots Nos. 7 to 10 (packed in cartons) none were considered sufficiently tender in the skin for a dessert prune; this is not surprising, as they were not examined until three months after packing. It is a pity that none of this series had been packed in cans.

The 1930 Experiments.

A.—As the Leeton Cannery process had given the best results for two seasons, but there was some question whether seven days' sweat after rinsing in water (cold wet sweat) was necessary, it was decided to try one, three, five and seven days' wet sweat, otherwise following the Leeton process.

B.—Prunes cold wet sweated seven days, exposed direct to steam (d'Agen fifteen minutes and Robe de Sergeant ten minutes) at 10 lb. pressure, then packed hot into cans. Cans exhausted fifteen minutes and cooked in boiling bath fifteen minutes.

C.—A process adopted from Bulletin 483 (Utilisation of Surplus Prunes) of the Agricultural Experiment Station, University of California. Prunes rinsed in cold water, dipped in boiling water for nine minutes, packed hot into cans, exhausted twenty minutes in boiling bath, cans raised, vents closed and cans removed.

D.—Prunes prepared and dipped as for C, but when dipping complete cans were sealed and cooked for ten minutes in steam at 20 lb. pressure.

E.—A process for canning stewed prunes "ready to serve" adopted from the above mentioned bulletin.

Examination of the various samples revealed the following facts:—

A.—No difference could be detected between prunes one day cold wet sweated and seven days cold wet sweated. The skin of both d'Agen and Robe de Sergeant was too tough.

B.—Steaming prunes before packing in cans resulted in a prune tender in skin and with flesh cooked. The Robe de Sergeant were excellent both in skin and flesh. The skin of d'Agen was tender, but the flesh rather overcooked.

C.—Dipping in boiling water instead of steaming before packing resulted in a prune superior to that from process A, but not as satisfactory as that from B.

D.—Prunes had developed mould. Probably ten minutes is not sufficiently long for heat to penetrate and sterilise a 7 lb. can in steam at 20 lb. pressure, though it took six minutes to raise the retort to 20 lb.

E.—The prunes approached a stewed prune state, but lacked the flavour and condition of a correctly stewed prune.

The 1931 Experiments.

A.—As steaming the prunes before packing had proved in 1930 the most satisfactory method of softening the skin and it had been shown that a one-day wet sweat gave equal results to a seven days' wet sweat, the 1931 trials were concentrated on steaming before packing. Experiment A was therefore discontinued.

B.—Prunes wet-sweated for not less than one day and then steamed; as against—

C.—Prunes rinsed in cold water just prior to steaming. Two periods of steaming were tried (ten and fifteen minutes), and later eighteen and twenty minutes were tried for Robe de Sergeant. Steaming was tried at 5 and 10 lb. pressure. The above were packed hot as they came from the steam retort into 7 lb. cans. The cans were then capped and exhausted about three parts submerged in boiling water bath for fifteen minutes with vents open. The vents were then closed, and the prunes sterilised fully submerged in boiling bath for twenty minutes.

D.—An attempt was made to steam the prunes after packing into cans but before capping, but the results were not at all satisfactory.

E.—Prunes were treated as those in process B, except that steaming was done at 10 lb. pressure only, and the prunes were allowed to cool off for thirty minutes before packing into cans.

F.—Prunes cold wet sweated for not less than one day, then steamed (1) for twenty minutes and (2) for twenty-five minutes, at no pressure, before packing into cans, exhausting and sterilising.

X.—The Californian bulletin recipe previously referred to, in which the prunes were dipped in boiling water instead of exposing to steam, was repeated at periods of ten and twelve minutes.

D'Agen Prunes.

The results of examination were as follows, d'Agen for convenience being dealt with first:—

B.—In this experiment (prunes cold wet sweated for not less than one day before steaming under pressure), d'Agen steamed for fifteen minutes at 10 lb. pressure (B4) were too moist and the flavour was over caramelised; d'Agen steamed for fifteen minutes at 5 lb. pressure (B5) were of good appearance, their flavour was satisfactory and not over-caramelised, and skin tender.

C.—In this series—prunes (no cold wet sweat) rinsed in cold water just prior to steaming—d'Agen steamed for fifteen minutes at 10 lb. pressure (C3) were too moist, and the flavour was over-caramelised; the skins of

d'Agen steamed for fifteen minutes at 5 lb. pressure (C4) were not sufficiently tender, and again the flavour was over-caramelised. Comparing B with C series, B4 shows no superiority over C3, which was steamed for the same period at 10 lb. pressure. B5, however, showed a superiority over C4, which was subjected to the same period of steaming at 5 lb. pressure. Though this indicates that the cold wet sweat had an influence in rendering the skin more tender, judging from previous experience of both the prune processors present and the Departmental officers concerned, it is thought that the difference was probably accidental. However, it seems advisable that further tests should be made on this point.

Comparing steaming at 10 lb. and at 5 lb. pressure, it is significant that in two instances in B and C series where d'Agen prunes were exposed direct to steam at 10 lb. pressure, the flavour was judged to be over-caramelised (see B4 and C3). Certainly, as will be seen in Experiment E, d'Agen exposed to 10 lb. pressure for fifteen minutes were deemed to be only slightly over-caramelised, which might probably be accounted for by the fact that the prunes in E series were allowed to cool off for thirty minutes after steaming before packing. In any case, as 5 lb. pressure of steam appears to be sufficient without any appreciable extension in period of steaming, it can be concluded that higher pressure is unnecessary and further tests between 5 and 10 lb. pressures are not required.

E.—D'Agen steamed for fifteen minutes at 10 lb. pressure and cooled for thirty minutes before packing into cans, exhausting and sterilising, resulted in a product the skin of which was sufficiently tender, with a flavour slightly caramelised. It is gratifying that the decision on d'Agen is encouraging, as the thirty-minute cooling after steaming allows the prunes to be handled without so much risk of damage as when handled quite soft and hot direct from steaming. Moreover, this slight drying-off tends to yield a less sticky skin and a freer running article, which is desirable.

F.—The result with d'Agen in this series indicates that the shorter period of twenty minutes steaming without pressure was not sufficient to soften the skin to the desired degree, while the longer period (twenty-five minutes) caused the flesh of the prune to become too moist and over-caramelised in flavour.

X.—The ten-minute dip in boiling water resulted in the skin of d'Agen being hardly as tender as desirable. The prunes were free-running, flavour not over-caramelised, and on the whole satisfactory. The twelve-minute dip rendered the flesh of d'Agen rather too soft, otherwise not appreciably different to the ten minute dip. Though dipping in boiling water is not considered as satisfactory as steaming under pressure for softening the skin, it does appear to offer a fairly satisfactorily alternative method where facilities for steaming under pressure are not available.

Robe de Sergeant.

The Robe de Sergeant prunes used in the 1931 season trials were evidently abnormal. Usually the skin of Robe is more easily softened than that of d'Agen. For instance, in the 1930 trials Robe steamed for ten minutes at

10 lb. pressure had a quite tender skin, whereas it took fifteen minutes steaming at 10 lb. pressure to soften the skin of d'Agen; but though fifteen minutes steaming at either 5 lb. or 10 lb. pressure softened the skin of d'Agen in 1931, the time had to be extended to eighteen minutes before the skins of Robe de Sergeant in 1931 were sufficiently soft. As fifteen minutes steaming was insufficient in either B or C series to soften the skin of Robe de Sergeant, and the period was extended to eighteen and twenty minutes only in C series, no indication could be obtained whether the cold wet sweat had any advantage. The decision given indicated that eighteen minutes steaming at either 5lb. or 10 lb. pressure was sufficient to soften the skin of these abnormal Robe de Sergeant prunes. When the time was extended to twenty minutes the flesh became too moist. It is worthy of note that even when steaming of Robe was prolonged to twenty minutes at 10 lb. pressure no complaint was made by the testers of an over-caramelised flavour. Hogg in his early work found that the flavour of d'Agen was easily affected in this way, and because of this and the naturally more tender skin and better size of Robe de Sergeant, confined his attention in his later work of processing dessert prunes to the latter variety.

E.—The Robe de Sergeant treated being abnormal, it is not surprising that those steamed up to fifteen minutes were not sufficiently soft in the skin. Those steamed for twenty minutes at 10 lb. pressure were slightly superior to those steamed for eighteen minutes at 10 lb. pressure, and that there was no complaint of the former being too moist, whereas a similar treatment of Robe (*i.e.*, twenty minutes at 10 lb. pressure but packed directly after steaming completed) were deemed too moist, as stated above, indicates again that cooling for thirty minutes after steaming before packing is advantageous.

F.—As the Robe de Sergeant prunes were not normal it is not surprising that the twenty minutes period of steaming at no pressure gave an unsatisfactory result. The twenty-five minutes period at no pressure showed an improvement, but the prunes were not equal to those treated for twenty minutes at 10 lb. pressure.

X.—Dipping in boiling water for periods of ten and twelve minutes failed to soften the skin of the abnormal prunes sufficiently.

Recommendations.

Though there are still some points to be cleared up in future trials, it is considered that sufficient progress has now been made to justify the following recommendations for the processing of dessert prunes:—

The prunes as they come from the sweat after completion of drying should be thoroughly graded; only the larger prunes should be processed as dessert prunes (as a rule, greater counts than 60-70 should not be used). The prunes should be thoroughly rinsed in dipping baskets, in cold water. If convenient, sufficient can be dipped to last two or three days' processing —they are not harmed by holding them in a moist state for a few days, and possibly may be improved. They should then be exposed direct to

steam at a pressure of 5 lb. for a period long enough to render the skin quite tender. During steaming the prunes should be held in wire dipping baskets or some receptacle that will allow the steam to circulate freely amongst them. The period of steaming necessary will vary with the condition of the prune, and from trials to date the variation may be from ten to eighteen minutes. The length of period necessary can be arrived at by testing (between the front teeth) several prunes from the first batch at intervals until the required tenderness of skin is reached. The skin should be sufficiently tender to offer no appreciable resistance to the teeth when bitten.

The condition of prunes even from the same orchard, in the same season, but taken from the trays at different periods, may vary, so that a test should be made from time to time as processing proceeds. It must also be remembered that even when prunes are only gathered as they drop from the trees, a variation will occur in a batch or sample, so that in testing several prunes should be tried, and an average period of steaming arrived at that will not make the softer prunes too mushy nor leave the harder ones too tough.

When steaming is completed, the prunes should be packed whilst hot into cans, the cans capped and exhausted with vents open, partially submerged in the boiling water bath, the vents then sealed, and the cans sterilised fully submerged in the boiling bath. When prunes are packed hot in this way fifteen minutes exhaust and twenty minutes sterilising has been found sufficient for 7 lb. cans. For 2 lb. cans ten minutes exhaust partially submerged and fifteen minutes with vents sealed and cans full submerged in boiling water has been found sufficient.

Where facilities for steaming prunes under pressure are not available, they may be dipped in boiling water for from nine to ten minutes instead of being steamed, then packed whilst hot and exhausted and sterilised as described above, though this latter method does not give quite as satisfactory results as steaming under pressure.

Plum Grade Standards in Queensland.

Advice has been received from the Queensland Department of Agriculture that plum grade standards have been proclaimed in that State, and will be enforced as from the 6th December, 1932.

The minimum diameters to which the various varieties must comply are as follow:—

Minimum Diameter of 1⅛ Inches.—Little Gem, Evans' Early, Blue Rock, Tibbits, and Early Orleans.

Minimum Diameter of 1¼ Inches.—Doris, Duffy's, Wright's Early, Santa Rosa, Wilson, and Angelina Burdett.

Minimum Diameter of 1½ Inches.—Burbank, Giant Prune, Pond's, President, Grand Duke, Black Diamond, Magnum Bonum, Coe's Golden Drop, Kelsey, Wickson, Ballena, Shiro, Beauty, Formosa, Sultan and October Purple.

Another Fungus Attacking Apple Stocks.

Sclerotium rolfsii SACC. RECORDED ON NORTHERN SPY IN NEW SOUTH WALES.

W. A. BIRMINGHAM, Assistant Biologist.

THE first record, so far as the author is aware, of the fungus *Sclerotium rolfsii* Sacc. attacking apple trees in New South Wales was made in April of this year. A number of plants have previously been recorded by the author[1] as having been attacked by this fungus, and by Weber[4], who recorded 189 host plants invaded by it.

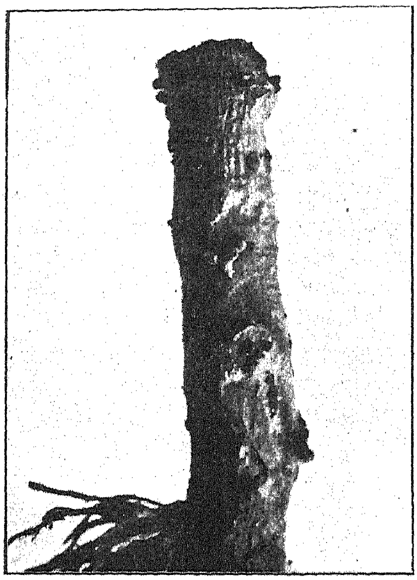


Fig. 1.—Northern Spy Apple Stock attacked by *Sclerotium rolfsii*. Note the small dark-coloured spherical bodies.

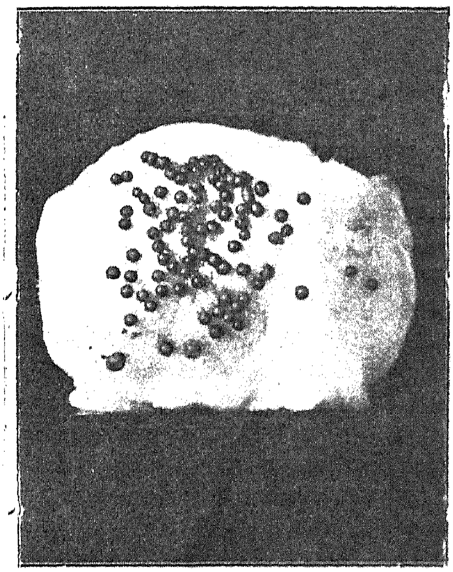


Fig. 2.—Sclerotia of *Sclerotium rolfsii* Growing on Moist Cotton Wool.

Sclerotium disease of Northern Spy stocks is recorded[5] as one of the most serious troubles in nurseries in South Africa and as most destructive of apple stocks. It is frequently observed that stocks die out in patches.

The Appearance of the Fungus.

Sclerotium rolfsii possesses a very aggressive mycelium (or vegetative part, which is composed of filaments), which under favorable conditions of moisture grows on almost anything, living or dead. It can lead a non-parasitic mode of existence, but occasionally becomes parasitic. On the parts invaded, it produces a dense, white, cotton-like mass of threads. Later, small, spherical mustard-seed-like bodies (sclerotia, or compact masses of fungus threads) are formed within this mass. These bodies at first

resemble white knots, but gradually turn yellowish-brown to brown. Goto[2] has recently determined the mature stage of *Sclerotium rolfsii* as *Corticium centrifugum* Herter. Higgins[3] states: " . . . when dry, the sclerotia remain viable for more than two years, but it is thought that they do not survive long on moist earth in the field."

A Record at Glenorie.

During April, 1932, Mr. E. C. Levitt, Orchard Inspector, submitted Northern Spy apple trees which he thought were attacked by Sclerotium, and examination of the sclerotia *in situ* left no doubt as to the invasion. Portion of one tree, on incubation at 25 deg. Cent. developed several sclerotia as seen in Fig. 1. The development of sclerotia on a mass of moist cotton wool in a moist chamber is shown in Fig. 2. The wood and bark tissues at the base of the stock of the specimens were dead, as was portion of the root system.

Inspector Levitt kindly forwarded the following observations:—

" Sclerotium attacking apples has been observed by me on two properties in this district, the first a small nursery at Glenorie, and the second an orchard at Dural, the attack being on trees planted from the nursery.

" The losses in the nursery would amount to approximately 50 per cent. of the planting and the young trees were killed in sequences up to ten, healthy trees intervening between infected areas; it was very seldom that an individual only was affected.

" The appearance of the trees was similar to what might be expected under extreme drought, a wilting of the foliage being followed by death of the foliage without immediate defoliation, the dead foliage adhering to the stem for some time. Infection occurred under ground level at depths ranging from ½ to 2½ inches. The first indication showed in the late spring and early summer, but most loss occurred in the late summer and early autumn. On the advent of cold weather, the fungus appeared to become inactive and no further infection has since been noted. The soil in the nursery is of a sandy nature.

"In the orchard at Dural, one section was planted with thirty-six trees worked to Willie Sharp, and immediately adjoining nine Northern Spy stocks were planted from old trees in the orchard. Of the thirty-six worked trees, sixteen died and ten more subsequently showed infection. Of the nine stocks, six died. It is considered that the stocks raised in the orchard were infected by the fungus being carried on the hoe, the whole planting having been worked with this implement several times during the summer.

" Another planting of fifty trees from the same nursery showed infection on only three trees. Hoe working on this section was limited. The soil in the orchard is a dark loam of shale origin, and the texture of the soil, good."

It is obvious that the infection was carried on the first batch of trees supplied by the nursery to the grower at Dural.

Control Measures Suggested.

Before planting all stocks should be carefully examined for the presence of a white fungus growth at the base, and especially for small, spherical, brown, mustard-seed-like bodies (sclerotia). If present, and the bark in the affected part shows indications of decay, it would be advisable to reject such trees. If the fungus has not invaded the bark tissues, the stocks should be thoroughly washed under a strong force of water to remove the superficial growth. The stocks might even be lightly scrubbed with a brush. The water used in the washing should not be allowed to find its way to cultivated areas.

The stocks, before planting, might be steeped in a solution of 1 pint of commercial formalin (40 per cent. formaldehyde) to 40 gallons of water for 10 minutes.

In the case of infected soil, the following measures, it is claimed, have given good results in eliminating the fungus.

An application of freshly-slaked lime at the rate of 1 ton to the acre, harrowed into the soil, followed by one or other of the following treatments:—

(*a*) Drenching the soil with a solution of 1 lb. of bluestone dissolved (in a non-metal vessel) in 7 gallons of water.

(*b*) Drenching the soil with a solution of corrosive sublimate in the proportion of 4 ounces to 50 gallons of water, applied at the rate of 1 gallon to the square foot of soil. The solution should be mixed in a non-metal vessel and handled with care, as it is very poisonous. It should be kept out of the reach of children and farm animals.

(*c*) Drenching the soil with ammoniacal copper carbonate at the rate of 1 gallon per square foot of soil. This is made up in the proportion of 5 ounces of copper carbonate, 3 pints of ordinary strong ammonia to 50 gallons of water. The copper carbonate should be mixed in a wooden vessel with sufficient water to make a thick paste; next add the ammonia to dissolve the paste; when all is dissolved dilute with water to 50 gallons.

Frequent cultivation to dry the top soil may be expected to create conditions less favourable for the growth of the fungus.

As *Sclerotium rolfsii* appears to be susceptible to cold, low temperatures may be expected to check its progress to some extent.

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Apiary Notes.

W. A. GOODACRE, Senior Apiary Instructor.

For the welfare of the industry, bee-keeping is governed by an Apiaries Act which also has certain regulations. Quite recently the Department found it necessary to draw attention to the penalty attaching to the non-observance of the conditions laid down, and those who have bees are again reminded that the chief provisions of the Apiaries Act are as follows:—

1. All bees must be registered, whether kept for commercial purposes or otherwise. No charge is made for registration. A form for the purpose can be obtained from the Department of Agriculture, Box 36A, G.P.O., Sydney.
2. The outbreak of any disease must be reported at once to the Department.
3. Bees may be kept only in properly constructed frame hives, the use of box hives being prohibited.

A penalty of £20 is provided under the Apiaries Act for neglect to observe any of the foregoing provisions.

How to Transfer Bees from Box to Frame Hives.

The objects of the compulsory use of frame hives are to facilitate the work of apiary inspection and the control and eradication of diseases found in bees. For the benefit of those who may have recently commenced bee-keeping and who may have bees in box hives and desire to transfer them to frame hives, the following instructions are given:—

Transferring work should be carried out during warm weather and when a honey flow is on.

For the box hive colony to be transferred, prepare a standard-size hive body complete with frames, and standard-sized bottom board and cover. All the frames with the exception of one should be wired, and contain sheets (preferably full ones) of comb foundation. Give the bees in the box hive some smoke, remove the hive from its stand, and substitute for the time being the frame hive minus the one empty frame; this new hive on the old stand will keep the field bees occupied for a while. Next turn the box hive upside down, remove its bottom board, and place an empty box, open side down, over the combs; have a neat fit if possible. Drum the bees up into the empty box by beating on the sides of the box hive with two stout pieces of board. When completed remove the box now containing the bees and place it temporarily over the frames of the new hive on the old stand. The combs may now be removed from the box hive. The best pieces of worker brood comb should be cut to fit neatly in the empty frame, and made secure with string fastened right around the top and bottom bar.

Next lift up the box of bees from above the frame hive, and place the frame of brood about the centre of the frame hive; replace the cover on the frame hive, and then dump the bees from the box at the entrance of the new hive, and allow them to enter. It is usually best to dump a few first and see that eager entry is sought, and then bump the remainder out. The bees should make a contented start in their new home, having brood for inducement.

After the first box hive has been successfully transferred as mentioned and good headway made in brood rearing, other box hives may be transferred by what is known as the second method of transferring. Secure a frame of brood (preferably with some larvae), and place it in a new prepared hive fitted with comb foundation. Invert the box hive, place the frame hive minus its bottom board over the combs and then drum the bees up into the frame hive. When the drumming is completed, the new hive, now containing the bees, is placed on its bottom board on the old stand. Remove the cover of this new hive and place a queen excluder over the frames; then on top of the excluder fit the old hive to act as a super for the time being. In three weeks a good brood nest should be established in the frames, and all of the brood in the old box above will have emerged, the queen being unable to return to it. The box may now be removed and the bees drummed out of it into an empty box and then dumped in front of the new hive. The combs can be removed from the box hive and the honey and beeswax made use of. There is no loss practically with this method of transferring.

To Secure Bees from a Bee Tree.

To secure bees from a bee tree—and many who are commencing apiary work will be interested in this aspect of apiculture—first prepare a box the same length and about three-quarters the width of a standard hive; this should be made so that frames will fit into it neatly, and a sliding wire cloth cover should be fitted so as to allow of ventilation. In most cases it is necessary to fell the tree. After exposing the comb and colony (preferably with the aid of a saw, mall, and wedges), carefully remove the honey and brood combs. The bees will then usually cluster. If the queen bee can be found, place her in a cage. The best pieces of brood comb should then be cut neatly to fit in a frame, and made secure with string fastened right round from the bottom bar and over the top bar. The cage with the queen is then fastened to the top of the inside of the box, and the frame of brood made secure in the box also.

The next procedure is to get as many bees in the box as possible, and then to place the box in a convenient position for the remaining bees to enter. It is generally advisable to leave the colony in this position for a few hours, so that as many flying bees may be collected as possible. The colony may then be taken home and transferred to a hive, in which the frame of brood is also placed. The queen is liberated, and a piece of queen-excluder fixed on the hive entrance, and left on for three days to prevent risk of the colony

Home-made Cheese.

A. B. SHELTON, Senior Dairy Instructor.

UNDER the Dairy Industry Act, cheese must not be manufactured for sale unless the premises are registered, but cheese suitable for home manufacture and home use can be made with very little special plant. Following are directions for making three cheeses of such a type.

Cheddar Type.

The night's milk should be perfectly sweet and when mixed with the morning's milk should show no sign of sour smell or flavour. Add clean, soured milk as a starter, stirring it thoroughly into the bulk. Rennet, at the rate of 1 drachm to 3 gallons of milk, is first diluted in water, the temperature of the milk is brought to 86 deg. Fahr., and the diluted rennet is quickly stirred in. In forty-five minutes the milk should firmly coagulate and be fit to cut. Care should be taken not to bruise the curd and cause excessive loss of fat in the whey. To cut the curd a long carving knife may be used to first slice it into vertical slices and then to cut the slices crossways. A wire breaker, or series of wires stretched across a frame to which is attached a handle, is then used to draw through the curd and reduce it to small cubes.

After cutting, do not disturb the curd for ten minutes; then stir gently, and gradually raise the temperature to 98 deg. Fahr., by withdrawing a portion of the whey into a bucket and standing it in boiling water to heat to about 130 deg. Fah., subsequently returning it to the bulk. Repeat the operation until the desired temperature is reached while the whey is still sweet. When the curd has attained a feeling of firmness, it is ladled into coarse cloths, which are then tied up tightly plum pudding fashion.

After half an hour, cut into 3-inch blocks, putting the outside of the curd inside, tie up again and turn the bundle over; this procedure is repeated once or twice. After one hour and a quarter, sufficient acid will have developed in the curd for salting; it should at this stage draw rather less than ⅛-inch threads when a small piece is rubbed on and withdrawn carefully from a hot iron. Break the curd up into small pieces and apply salt at the rate of 1 ounce to 3 lb. curd, mixing it in thoroughly. When the salt has been absorbed, the curd is ready for moulding and pressing.

The curd is filled into tin moulds or hoops lined with clean cloth, and a wooden follower made to slip into the hoop is placed on top of the cloth. Pressure is applied gradually by means of a lever arrangement for about twenty hours, when the cheeses are removed from the moulds to a cool atmosphere. The rinds may then be wiped occasionally with a cloth dipped in brine.

This cheese is very palatable if allowed to cure for a week or two, providing it is made from clean milk.

Cottage Cheese.

Allow milk to sour and thicken at a temperature of 70 to 75 deg. Fahr. When thickened, carefully break into small particles (but not too fine, or the cheese will be sandy, gritty or tough), and stir gently, heating meanwhile gradually up to 110, 120, or even 130 deg. Fahr., but not higher. Stop heating when the curd is dry and firm enough to drain—a half hour of heating is usually enough.

Allow the curd to settle for a minute and then drain off as much whey as possible by tipping the pan. Fill immediately with cold water, and after stirring, pour off. Repeat this several times until the temperature of the mixture of curd and water is about 70 deg. Fahr. Then tip into strainer on a cloth and drain for five to ten minutes; add salt and stir in thoroughly. A hundred pounds of skim milk gives not less than 12 lb. of curd and needs salting with 2½ to 3 ounces (a level tablespoon is about an ounce).

Pack cheese and hold as cold as possible.

Soft Cheese.

Take 3 gallons of clean sweet whole milk and put into a small cylindrical can or bucket. Heat the milk to 165 deg. Fahr. by placing the can in hot water and meanwhile stirring the milk gently, and then cool as quickly as possible by standing in cold water, reducing the milk to a temperature of 72 deg. Fahr. Add a few drops of starter or clean-flavoured thick milk and stir well through the milk; then stir in a few drops of rennet diluted in cold water at the rate of 1 part rennet to 99 parts water, using sufficient diluted rennet to cause firm coagulation in twelve hours overnight, meanwhile maintaining the temperature of the milk at 72 deg. Fahr. When firmly coagulated, pour or ladle the curd on to a strainer rack covered with clean cheese cloth and allow the whey to drain from it.

Renneting should be so regulated that the curd at this stage has just sufficiently soured (or in other words has developed just sufficient acidity) to allow firm coagulation. Over-acidity spoils the characteristic flavour. While it is draining on the racks the outside portion of the curd should be stirred into the moist centre to prevent hard particles forming from excessive drying. Some pressure may be used to aid in expelling the whey. When all the free whey has escaped, salt is applied at the rate of 1¼ lb. to 100 lb. curd, and the curd is shaped in small cylindrical moulds and later wrapped in parchment paper or tinfoil.

This cheese is ready for eating in twenty-four hours, and under cool conditions will keep for short periods.

THE TRUSTEES of the Australian Museum issue a quarterly magazine to maintain public interest in the work of the Institution and inform the nature lover of the activities of the various sections of the Museum in the preservation of wild life. The current issue is up to the usual high standard, containing brightly written articles and unique photographs and drawings.

Dairying Notes.

Rules for Calf-rearing.

The following are the most important rules to observe in calf-rearing:—

1. Always handle calves quietly and patiently.

2. Feed at regular times each day and in regular quantities.

3. Feed only clean sweet milk. Add some constituent to replace the feed value of the cream removed from the milk, and lime-water (see paragraph below) to assist digestion. Milk should be pasteurised if possible, and on no account should the froth be given to calves.

4. Feed the milk at body temperature. Cold milk requires a great deal of the animal's energy to heat it up to a point at which digestion can take place.

5. Cleanse feeding buckets as carefully as you would all other dairy utensils.

6. Keep the yard and its surroundings clean, and free of harbour for flies, which are active carriers of disease.

7. Provide shade in summer, and shelter from winter wind and rain.

8. Provide a suitable lick consisting of salt and bonemeal.

To Make Lime-water.—Lime-water of the requisite strength is easily made on the farm. There need be no fear of making it too strong, as water will only dissolve a certain limited amount of lime—½ grain to the ounce, or 10 grains to the pint. Add a bucketful (say, 20 lb.) of lime to about 10 gallons of water in a wooden barrel, stir well, and allow to settle. The clear liquid resulting can be used, and water added and stirred daily until all the soluble portion of the lime has dissolved—the lack of alkaline flavour will indicate when this point has been reached, and a fresh supply of lime should be added to the barrel.

The Problem of Boiling Water for Cleansing Utensils.

It is safe to say that the small percentage of inferior cream now delivered to factories would be almost eliminated if the methods of treating dairy utensils were such as to ensure absolute cleanliness. By far the greater portion of this small amount of inferior cream is brought about by the utensils not being properly cared for.

The question of an effective boiling water supply on the farm has been rendered more difficult of late years on highly improved properties by reason of the shortage of wood. This has not yet reached an acute stage generally, and where it has steps can be taken to overcome it. Older dairying countries have had the same problem to face and have adopted modern water heaters—electric heaters (where cheap power has been available) and other

methods. We have hardly reached that stage, but consideration might be given on certain farms to the installation of bricked-in coppers (where not already done) as an economical means of heating water and for cleansing dairy utensils. The ordinary chip bath heater is a convenient method of using up cobs, waste paper, etc., but care must be exercised to see that the water is heated sufficiently.

To treat the utensils effectively the water must be close to boiling point. Warm water is of very little value, and water which has been heated some distance from the dairy and left to stand at the wash-up bench for five or ten minutes after being removed from the fire quickly cools off to well below boiling point. The most effective method is to place the separator parts and the smaller dairy utensils, after properly washing, in the vessel used for heating water (be it a copper, kerosene tin, or whatever is used), while still on the fire, making sure that the water comes to the boil. After five minutes, remove utensils and hang up or stand in a clean atmosphere. They will dry thoroughly in a few minutes without resource to rags, and will be in perfect condition for the next milking. Set-in coppers are very useful for this purpose, and are not only economical as to the wood supply, but are effective in wet weather. It is, of course, necessary to treat the utensils as outlined *twice daily, i.e., after each milking.*

Precautions Necessary When Dipping for Cattle Tick.

When dipping in arsenical solution for control of cattle tick takes place under favourable conditions it has little or no effect on the cattle. The only consequence in such circumstances is the formation of a slightly scurfy condition of the skin, which is of no importance, and which is only present for the first one or two dippings. Dipping by itself is not only not injurious, but is often beneficial, as in addition to destroying the tick, it destroys lice, and when carried out regularly over a period has an influence on unhealthy skin conditions generally.

The ill effects of dipping cattle are shown when it is necessary to move them after treatment. Bullocks appear to be particularly affected by the arsenical dip when worked. The effects show themselves usually three or four days after dipping, and the bullocks are noticed soon to tire when in waggon or plough, and show shortness of breath. These symptoms are particularly noticed in hot weather.

Although dipping in itself does not cause injury to the skin of cattle, yet under certain circumstances severe injury may ensue. Fortunately, a knowledge of such circumstances enables us to avoid the ill effects of dipping. It is essential that dipped cattle should dry quickly, and if from any cause drying is delayed for a long period, then ill effects may follow, especially if the cattle are driven when still wet. For example: If cattle, after dipping, are subjected to a drizzling rain for several hours, just sufficient to keep them wet without being heavy enough to wash the mixture from the skin, bad results may follow, especially if they are driven. If the weather is hot, the effect of the dip on the animals may be further increased.

In cases where cattle are affected with skin disease, with even slight cracking of the skin, the absorption of arsenic will be much greater than if the skin is healthy. It occasionally happens that out of a mob dipped in the one mixture and subjected to exactly similar treatment, both before and after dipping, one beast will be scalded, and this isolated case is no doubt due to some skin trouble not noticed by the owner. The period of the season also has an influence on the effect of the dip. It has the greatest effect in the heat of the summer on days when the temperature is high and the atmosphere humid.

Deaths and injury by scalding may occur to cattle dipped in baths containing arsenical mixtures, but the vast majority of such happenings are due to carelessness. To avoid loss and injury the following precautions are recommended:—

Cattle should never be dipped when heated, tired, and thirsty. If they have been driven to the dip, they should be allowed time to cool and rest before they are dipped.

Cattle should always be watered a short time before they are dipped. After they emerge from the bath they should be kept on a draining floor until the dip ceases to run from their bodies; then they should be placed in a yard until they are quite dry. If cattle are allowed to drain in places where pools of dip collect, from which they may drink, or are turned at once on to pasture where the dip will run from their bodies on to the grass and other vegetation, serious losses are liable to result.

Crowding the animals before they are dry should also be avoided.

Dipping should be avoided on rainy days, for the reason that the rain-water tends to wash the dip out of the animal's coat and from the skin.

Animals may be dipped at any time of the day provided time is allowed for drying before they are driven, or in the case of working bullocks before they are yoked up.

Calves should not be dipped with their mothers, for two reasons: In the first place, the cows would probably trample on the calves in the race, and in the dip itself they might drown them; and in the second place, the cows frequently lick their calves after dipping, thereby incurring the danger of arsenical poisoning.

After dipping is completed, allow the cattle to walk slowly back to their paddocks.

The Losses from Sterility.

Addressing a conference of members of the Agricultural Bureau of New South Wales at Woonona recently, Mr. B. C. Veech, Government Veterinary Officer, drew attention to the great loss that resulted from sterility and allied diseases in dairy cattle.

It was estimated on good authority, he said, that a large percentage of dairy stock was affected with diseased conditions of the genital organs, with consequent loss in offspring and dairy products, loss of the feed supplied to

such animals and of the time required for feeding it, and loss of money spent on unsuitable drugs, or even on the proper drugs for unsuitable animals. Those losses were continuous, since the keeping of such affected animals tended to contaminate the pastures and clean animals.

The possibility of mineral deficiency should be considered where sterility existed in some herds or cows. In some parts of the State, chiefly dairying districts, the soils were deficient in two essential minerals, viz., calcium, or lime, and phosphorus. On several occasions the Department had recommended the addition of sterilised bonemeal to the daily ration with such advantage that cows which previously had failed to get in calf became pregnant.

While many owners admitted that sterility and abortion existed in their herds, others did not do so until great loss resulted and many of their cattle were spreaders of these diseases. Lack of knowledge of the causes of sterility and allied diseases by stockowners, and also their failure to co-operate with the officers of the Stock Branch of the Department, were the two outstanding factors connected with the problem of preventing these losses.

The Marketing of Butter in England.

A report on the marketing of butter in England and Wales, recently issued by the Ministry of Agriculture of England, points out that for recent years the two main sources of butter imported into England and Wales have been Denmark and New Zealand, which in the four-year period 1927-30 supplied annually an average of 2,133,300 cwt. (or 34 per cent. of the total imports) and 1,335,700 cwt. (or 21.3 per cent.) respectively. Other important sources of supply were Australia (with 770,100 cwt., or 12.3 per cent.), Irish Free State (with 558,400 cwt., or 8.9 per cent.), Argentina (with 375,800 cwt., or 6 per cent.), and Russia (with 285,600 cwt., or 4.5 per cent.).

During the present century the Empire share of the total butter imports rose from 18 per cent. in the first five years to over 46 per cent. in the five years ended 1926. During the period 1927-30 there was a slight downward tendency, but the remarkable increase in butter imports in 1931 was almost entirely due to the development of Empire supplies, and in that year 48 per cent. of the total butter imported was obtained from Empire countries.

This increase in the proportion of Empire imports was due largely to the growth of consignments from Australia and New Zealand. Australian imports showed considerable variation from year to year, owing mainly to climatic conditions and to the fact that a considerable portion of the total output is retained for home consumption. In 1931 supplies from Australia —amounting to 1,558,600 cwt.—increased to more than double the average for the years 1927-30.

The Possibilities of Expansion of Manufacture in Britain.

Although the butter industry is the largest outlet for milk outside the liquid milk market, less than 14 per cent. of the total milk output of Great Britain is used for butter-making. The increasing demand of the fluid milk

market and the development of improved facilities for transport and distribution have made the sale of milk for liquid consumption the main concern of the dairy-farmer.

But there is a limit to the quantity of milk that can be disposed of in liquid form at a remunerative price, the report points out. How to secure the diversion of "surplus" milk into manufacturing outlets and to prevent its being offered for sale in a saturated fluid milk market is, therefore, one of the main problems of milk marketing organisation. At present, cheese-making, which utilises more of the constituents of the raw material than butter-making, is the method generally used by the distributive trade for converting "surplus." Any marked depression of milk prices due to increased pressure of supplies would also result, no doubt, in an increase of cheese-making on farms. Nevertheless, the demand for butter that is met by imported supplies has represented a milk equivalent, during the past three years, of over 1,800 million gallons per annum, and any expansion of the home butter industry to meet some part of this demand would obviously have an important bearing on the main marketing problem of the milk industry.

The possibility of such expansion largely depends, of course, on the possibility of producing butter in England at a price that will enable it to compete with the imported product, making allowance for any preference that there may be for the home product because of its relative freshness and because it is a home product. When milk marketing has been efficiently organised this possibility may seem less remote than it does to-day. Meanwhile, it is desirable to examine the marketing technique of the home butter industry in order to see what improvements can be made and to prepare the way for developments that may come.

The Opportunities for an Export Trade in Dairy Cattle.

There appears to be every evidence that an export trade in dairy cattle with China and other Asiatic countries is being built up. Attempts to build up this trade in the past have, at times, been completely spoilt by carelessness, not only as regards the type of cattle sent, but also as regards their health. Just as Australia wishes to prevent the introduction of further disease, so do the countries obtaining cattle from Australia. If countries importing Australian cattle found that their requirements regarding precautions against the introduction of diseases were not attended to, they would cease buying Australian cattle. New South Wales is in a particularly favourable position to obtain this trade, because so many of the best dairying districts are protected against pleuro-pneumonia. The Department of Agriculture carries a very heavy responsibility in this matter, and has quite recently refused to issue certificates in some cases. Some shippers do not appear to realise that this Department will not issue certificates haphazard, and that the necessary time must be allowed for inquiries to be made. Those concerned in the purchase of cattle for export would do well in their own interests and the interests of the trade generally to consult the veterinary branch of the Department before purchasing, in order that they may not find later that some particular certificate cannot be issued.

Winners in the State Dairy Championship.

The judges, Messrs. C. J. Sanderson, Senior Veterinary Surgeon, J. N. Whittet, Agrostologist, and F. Wilkinson, Senior Dairy Instructor, made the following awards in the State dairy championship:—

	Points.
1st—A. F. Emmott, Bodalla ("Uncle Wiseman" Cup, valued at 25 guineas)	1723
2nd—W. J. Hammond, Bellingen (P. D. S. Cup, valued at 15 guineas)	1663
3rd—A. R. Martin, Wagga (Dangar, Gedye Cup, valued at 5 guineas)	1578

Points scored by the other finalists are as follows:—J. M. Miller, Gerringong (1478 points); C. M. and W. E. Chaffey, Tamworth (1412); Dr. F. O. Stokes, Taree (1365); R. Thornton, Kyogle (1330); W. H. Dudgeon, Binna Burra (1324); G. V. Ralston, Seaham (1299); A. E. Tomkins and Son, Mudgee (1194).

Ten districts, with a total of about 120 entries, competed in the competition, the winners in each district competition being eligible to compete for the championship honours.

Pasture Improvement Work on the North Coast.

Through the generous action of the Australian Dairy Council and Australian Fertilizers Ltd., in providing a substantial subsidy to meet the expenses of stationing a departmental officer on the North Coast, it has been made possible to appoint Mr. L. W. McLennan, Assistant Agrostologist, to undertake pasture improvement work in that district. Mr. McLennan will proceed to his new headquarters at Lismore early in the New Year.

The Minister for Agriculture (Hon. Hugh Main, M.L.A.) is highly gratified that outside organisations have given such practical recognition to the valuable pasture improvement work which the Department has carried out in recent years and he anticipates that an immediate effect of this latest appointment will be an extension of pasture top-dressing and the sowing of grass mixtures in north coast districts.

Feed the Dry Cow.

It cannot be repeated too often that the only time a cow gets a chance to store the materials required for the next season's milking is when she is dry. During that period she must store up in her body and skeleton a supply of the materials she converts into milk. Experiments, often repeated, show that no matter how she is fed after calving, calcium (lime) cannot be assimilated in sufficient quantity for her production of milk; there is always an adverse balance and unless she starts milking with a big reserve, she cannot continue to milk profitably for long.

According to the Canadian Bureau of Statistics, Australia's exports to Canada for the fiscal year ended 31st March, 1932, amounted to $5,696,770 as against $4,616,722 for 1931, representing an increase of $1,080,048 on the year. In the list of Canada's importing countries Australia moved up to seventh place in 1932 from sixteenth place in 1931.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
J. L. W. Barton, Wallerawang	20	1 Jan., 1933
Department of Education, Brush Farm, Eastwood	8	3 ,, 1933
Wollongbar Experiment Farm, Lismore (Guernseys)	119	3 ,, 1933
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay	9	3 ,, 1933
A. N. de Fraine, Happy Valley Dairy, Inverell	9	6 ,, 1933
W. Pigg, Redlands Dairy, Inverell	33	6 ,, 1933
Lunacy Department, Morisset Mental Hospital	27	7 ,, 1933
W. T. Herbert, Racecourse Farm, Bega	40	7 ,, 1933
C. J. Parbery, Allawah, Bega	108	8 ,, 1933
W. W. Martin, "Narooma," Urana Road, Wagga	141	13 ,, 1933
E. E. Winder, Wybong Road, Muswellbrook	46	14 ,, 1933
J. Davies, Puen Buen, Scone (Jerseys)	147	14 ,, 1933
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1933
Newington State Hospital and Home	100	17 ,, 1933
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1933
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys)	80	22 ,, 1933
J. B. Burtenshaw, "Sunnyside," Inverell	36	27 ,, 1933
Parker Bros., Hampton Court Dairy, Inverell	74	27 ,, 1933
W. K. Frizell, Rosenstein Dairy, Inverell	44	28 ,, 1933
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	21	28 ,, 1933
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1933
New England Girls' Grammar School, Armidale	29	3 ,, 1933
Lidcombe State Hospital and Home	149	3 ,, 1933
G. L. Genge, "Easton," Armidale	33	4 ,, 1933
A. B. Finney, Fox Ground, Gerringong	29	11 ,, 1933
George Rose, Aylmerton	3	23 ,, 1933
Riverina Welfare Farm, Yanco	89	24 ,, 1933
Department of Education, Yanco Agricultural High School	39	24 ,, 1933
Mittagong Farm Homes	36	24 ,, 1933
Liverpool State Hospital, Liverpool	72	3 Mar., 1933
Miss Brennan, Arankamp, Bowral	17	8 ,, 1933
G. W. Young, "Boorganna," via Wingham	41	10 ,, 1933
Lunacy Department, Kenmore Mental Hospital	80	27 ,, 1933
P. M. Burtenshaw, Killean, Inverell	66	6 April, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra	20	6 ,, 1933
A. D. Frater, "Fairview Dairy," Inverell	51	6 ,, 1933
A. H. Pye, Loch Levan, Inverell	47	7 ,, 1933
W. Newcomb, "Minnamurra," Inverell	72	7 ,, 1933
Rydalmere Mental Hospital	77	7 ,, 1933
St. Joseph's Girls Orphanage, Kenmore	11	13 ,, 1933
St. Joseph's Convent, Reynold-street, Goulburn	3	14 ,, 1933
St. Michael's Novitiate, Goulburn	4	14 ,, 1933
Marion Hill Convent of Mercy, Goulburn	47	15 ,, 1933
G. A. Parish, Jerseyland, Berry	93	21 ,, 1933
Australian Missionary College, Cooranbong	72	5 May, 1933
W. M. McLean, Five Islands Road, Unanderra	76	6 ,, 1933
Koyong School, Moss Vale	3	11 ,, 1933
Tudor House School, Moss Vale	21	13 ,, 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	226	2 ,, 1933
W. Hammond, Bellingen	77	16 ,, 1933
Hurlstone Agricultural High School, Glenfield	44	22 ,, 1933
E. C. Nicholson, Jillamatong, Corowa	180	23 ,, 1933
St. John's College, Woodlawn, Lismore	47	23 ,, 1933
Grafton Experiment Farm	271	14 July, 1933
P. Ubrihien, Corridgeree, Bega	123	15 ,, 1933
William Thompson Masonic School, Baulkham Hills	37	20 ,, 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns)	100	20 ,, 1933
G. V. Ralston, "Porphyry," Seaham	98	21 ,, 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook	37	17 Aug., 1933
A. L. Logue, Thornboro, Muswellbrook	36	17 ,, 1933
E. W. Flower, Binna Burra	56	18 ,, 1933
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	43	25 ,, 1933
Sacred Heart Convent, Bowral	10	26 ,, 1933
Lunacy Department, Parramatta Mental Hospital	12	1 Sept., 1933
Department of Education, Gosford Farm Homes	38	2 ,, 1933
James McCormack, Tumut	98	9 Sept., 1933

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 „ 1933
G. Powell and Sons, "Loch Lomond," Armidale	22	20 „ 1933
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1933
E. E. McMullen, Springnook, Holbrook	31	3 Nov., 1933
W. R. Boughton, Holbrook	33	3 „ 1933
C. Maynard, Holbrook	12	3 „ 1933
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 „ 1934
St. Patrick's College, Goulburn...	8	21 Sept., 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 „ 1934
Wagga Experiment Farm (Jerseys)	53	25 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone	92	9 Nov., 1934
Wolaroi College, Orange	11	10 „ 1934

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis :—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—MAX HENRY, Chief Veterinary Surgeon.

INFECTIOUS DISEASES REPORTED IN NOVEMBER.

THE following outbreaks of the more important infectious diseases were reported during the month of November, 1932 :—

Anthrax	7
Blackleg	5
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	5
Swine fever	Nil.
Contagious pneumonia	1
Necrotic enteritis	1

—MAX HENRY, Chief Veterinary Surgeon.

IODINE DEFICIENCY NOT MARKED IN AUSTRALIA.

RECENTLY reports were published by the Council for Scientific and Industrial Research indicating that iodine deficiency is not marked in Australia so far as live stock are concerned. An illuminating report is now available (*Journal of Agricultural Research*) from Pennsylvania, where also iodine deficiency is not marked. Iodine was administered in the form of iodised linseed meal to cows, calves, lambs and fowls. The cows were in a herd affected with contagious abortion, and it was found that the administration of iodine had no effect on the progress of the disease as indicated by the agglutination test. In the experiments with calves, lambs, and fowls, no beneficial result in the growth of calves and lambs or in the growth or egg-laying of the birds was noted. In the case of the calves, when heavy doses were given, unfavourable results followed.

Poultry Notes.

January.

E. HADLINGTON, Poultry Expert.

Economic Waste of Cockerels.

From time to time in these "Notes" poultry farmers have been urged to pay more attention to the handling of the cockerel portion of their young stock so as to make this side of poultry farming a source of profit instead of a dead loss. In the lean times which the poultry industry is passing through poultry farmers should not neglect any aspect of their operations which may be revenue-producing, and yet every season the majority sacrifice their young cockerels in the markets for next to nothing instead of turning them to good account and making them contribute something towards the rearing of the pullets.

Because of the haphazard way in which the cockerels are handled on most farms, it has become an accepted fact that it does not pay to rear them, and consequently they are looked upon as a waste product and are treated accordingly. So long as this attitude exists there can be no improvement, and the market will continue to be flooded with poussins and small grillers between September and Christmas. These birds cannot be cold stored satisfactorily for any length of time and being so small are disappointing to the consumer, which results in a lessened demand, whereas larger birds would sell more readily to the average consumer, and could be stored for the time of the year when young birds are not procurable in any numbers, or, if sufficiently good in quality, could be exported. Thus a firm market could be held if better quality birds were supplied.

In many cases the conclusion that it does not pay to rear these birds to a suitable age is based upon an erroneous idea of the cost of feeding, but in others lack of accommodation is the deciding factor, and it is realised that in some instances it is a case of giving the pullets a chance by clearing out the cockerels at an early age, though where land is available the cost of erecting additional colony houses and yards for rearing the cockerels in would soon be repaid by the better prices realised. In most cases the chickens are passed through the brooder stage before the cockerels are marketed, and they could be placed in colony pens direct from the brooders, where an intermediate stage is not available, provided that the houses are made cosy until the birds have been taught to roost.

Cost of Feeding.

With regard to the cost of feeding, information was given in these "Notes" last September showing the cost for each four weeks from the time the chickens were hatched till twenty-four weeks old, the costs being based on the simple ration fed on the Department's farms where results equal to

any are obtained in the development of young stock. These figures are given again hereunder for the benefit of those who may not have seen them previously:—

1st four weeks	¾d. per chicken.
2nd ,, ,, ...	2d. ,, ,,
3rd ,, ,, ...	4d. ,, ,,
4th ,, ,, ...	4d. ,, ,,
5th ,, ,, ...	4½d. ,, ,,
6th ,, ,, ...	6d. ,, ,,

Total cost up to twenty-four weeks, 1s. 9¼d. per chicken.

In arriving at these costs ample allowance was made to cover the landing of the various foodstuffs in ton lots on the average farm in the County of Cumberland.

Those who are not acquainted with the method of feeding recommended by the Department can obtain the information in leaflet form upon application.

From the figures quoted it will be seen that the cost of feeding to the age of sixteen weeks would amount to only 10¾d. per bird, and to twenty weeks 1s. 3½d. Between these ages well-grown cockerels direct from range, without any topping off, have been realising good prices all through the past season, as will be seen from the following particulars of birds marketed from the Government Poultry Farm, Seven Hills, and Hawkesbury Agricultural College, Richmond. These birds were sold in the poultry markets under the same conditions as those from private farms.

Returns from Cockerels Marketed from Departmental Farms.

Date.	Pairs of Cockerels.	Age.	Average Live Weight.	Price per Pair.	Average.
1932.		Weeks.	lb. oz.	s. d. s. d.	s. d.
18 October ...	22 White Leghorns	16 to 17	3 9·1	5 10 to 7 5	6 5
24 ,, ...	5½ heavy breed ...	16 ,, 17	4 5·1	6 9 ,, 8 8	7 9
24 ,, ...	27½ White Leghorns	15 ,, 17	3 6·3	4 5 ,, 7 5	5 9
26 ,, ...	22 ,,	15 ,, 16	3 2·2	4 1 ,, 5 11	5 0
2 November ..	22 ,,	16 ,, 17	3 7·3	4 5 ,, 4 10	4 7
9 ,, ...	22 ,,	15 ,, 17	3 6·5	4 11 ,, 5 8	5 3
14 ,, ...	45 ,,	15 ,, 17	3 4·4	3 11 ,, 5 6	4 11
16 ,, ...	18 heavy breed ...	16 ,, 17	4 7·6	5 8 ,, 7 1	6 8
23 ,, ...	10 ,,	16 ,, 17	4 7·2	5 0 ,, 7 11	6 3
23 ,, ...	23 White Leghorns	14 ,, 17	3 3·5	3 10 ,, 6 0	4 11
28 ,, ...	20 ,,	16 ,, 17	3 9·2	4 1 ,, 6 6	5 8

These figures are definite evidence of what is possible under good commercial poultry-farming conditions, and a survey of the markets at various times showed that the same class of birds from private farms realised similar prices.

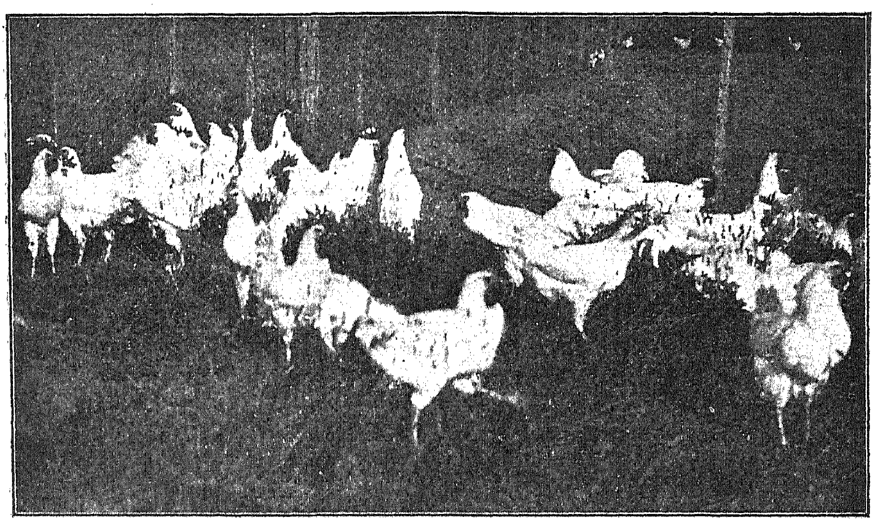
Cockerel Fattening Tests.

With the object of giving definite information on the question of topping-off cockerels for market, a test has been carried out at Hawkesbury Agricultural College. Forty-five birds, consisting of White Leghorns, Black

Orpingtons, and Langshans, as even as possible in ages and weights, were selected and placed in wire-bottomed coops, three birds to a coop, and fed on a sloppy ration mixed with skimmed milk. The ration fed was as follows:—

Pollard	40lb.
Bran	30lb.
Wheatmeal	15lb.
Maize meal	15lb.
Total	100lb.
Salt	22oz.

The birds were fed three times per day and given as much as they would clean up each time. Milk was also supplied to them to drink, but no water was given. During the first three days they were fed lightly, and after that they received as much as they would eat. On the first day Epsom salts was



The Type of Cockerels which Realised the Prices Quoted.

given in water at the rate of 2 oz. to the gallon. The birds were confined for three weeks and were weighed each week in order to ascertain the increase in weight during that period.

As a check, the same number of birds of each breed of equal ages and weights were selected, and after being marked were placed back in the colony yards from which both lots were selected and were fed on the usual College ration, consisting of about two-thirds pollard, one-third bran, and 6 per cent. meat meal mixed with water in which salt has been dissolved at the rate of 22 oz. per 100 lb. At midday the birds were given the same mash without the meat meal, and the evening meal comprised two-thirds wheat and one-third cracked maize. This check group was also weighed each

week for three weeks at the same time as those in the coops. The following table shows the weights of both groups at the different periods of weighing:—

RESULTS of the Two Methods Compared.

Number and breed.	Average weight at commencement of test.	Average weight at 7 days.	Average increase in first 7 days' period.	Average weight at 14 days.	Average increase in second 7 days' period.	Average weight at 21 days.	Average increase third 7 days' period.	Average increase in 21 days.
Group 1.—Milk Fed for twenty-one days, confined in Coops.								
	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
18 White Leghorn cockerels	3 3·9	3 11·33	0 7·43	4 0·1	0 4·77	4 3·1	0 3	0 15·2
22 Orpington and 5 Langshan cockerels	4 1·5	4 9·3	0 7·8	4 15·7	0 6·4	5 2·4	0 2·7	1 0·9
Group 2.—Check Birds on Free Range.								
18 White Leghorn cockerels	3 5·7	3 9·33	0 3·63	3 12	0 2·67	3 15·06	0 3·06	0 9·36
22 Orpington and 5 Langshan cockerels	4 1·7	4 4·1	0 2·4	4 6·44	0 2·34	4 9·8	0 3·36	0 8·1

It will be noted that Group I (birds confined in coops) showed an average increase in weight of approximately 1 lb. per bird for the three weeks, whereas those running on free range averaged only slightly over ½ lb. It is interesting to note the increase in weights each week in the two different groups. In Group I the greatest increase was during the first week, and the gain was reduced during the second and third weeks, whereas in the group on free range the increase was greatest in the third week.

At the conclusion of the test the birds in both groups were marketed in the usual way, but no distinction was made between the groups by the auctioneer. The birds were sixteen weeks old and the prices realised were as follows:—

Group I—

9 pairs White Leghorn cockerels ranged from 5s. 6d. to 6s. 8d. per pair, averaging 6s. 2d. per pair.

13½ pairs Orpingtons and Langshans ranged from 5s. 7d. to 8s. 4d. per pair, averaging 7s. 2½d. per pair.

Group II—

9 pairs White Leghorn cockerels ranged from 5s. 6d. to 6s. 1d. per pair, averaging 5s. 10d. per pair.

13½ pairs Orpingtons and Langshans ranged from 6s. 6d. to 7s. 2d. per pair, averaging 7s. 0½d. per pair.

It will be noted that the prices are not much in favour of the fattened birds, but no doubt higher values could have been realised had the buyers been informed that the birds had been specially fed prior to marketing.

The test indicates that birds specially topped off for two or three weeks show a greater gain in weight than birds running on free range, and where the birds are properly handled and fed a period of fattening would give somewhat better results, but it is questionable whether on the average farm there is much to be gained by special treatment when the extra labour and cost of feeding is taken into account. At any rate, the prices realised by birds direct from free range must be regarded as satisfactory, and there is no reason why most poultry farmers could not secure equal results if they studied the matter of marketing table poultry.

CONTENTS.

VOL. XLIV. PART 2. FEBRUARY 1, 1933.

Agricultural Gazette of New South Wales.

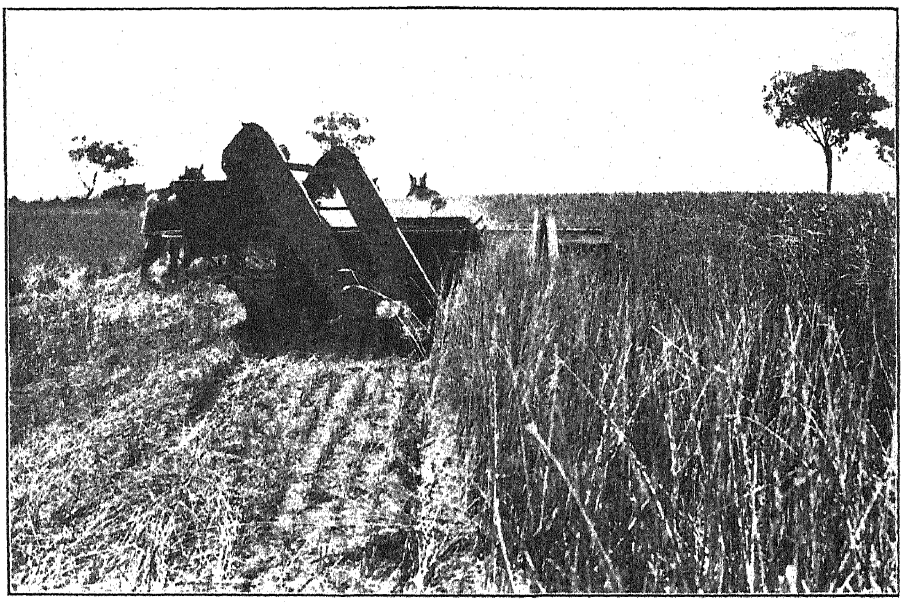
The State's Best Wheat Growers.

REPORTS OF CHAMPIONSHIP FIELD WHEAT COMPETITIONS, 1932.

The Riverina Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

This year's championship field wheat competition was the most successful yet carried out in the Riverina wheat area. The number of local associations which organised competitions is greater than in any previous year, and the crops submitted in the championship were of a very high standard, the average of the estimated yields of the whole of the crops being 38 bushels per acre, which is a record for this division.



A Harvesting Scene.

Thirteen districts were represented in this competition, namely, Ardlethan, Ariah Park, Barellan, Barmedman, Berrigan, Bidgeemia (Agricultural Bureau), Deniliquin (Farmers and Settlers' Association), Griffith, Lockhart, Narrandera, Oaklands (Farmers and Settlers' Association), Walliston (Farmers and Settlers' Association) and West Wyalong. Judging was commenced at West Wyalong on 21st November, and completed at Lockhart on 25th idem.

* This championship competition was judged by Mr. Stening.

Details of Awards—Riverina Wheat Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per Acre.	Quantity of Superphosphate per Acre.	Number of Crops Grown Previously.	Rainfall during Effective Period (April to October).	Points awarded. Apparent Yield. (One point per bushel.)	Trueness to Type. (Max. 20 points.)	Freedom from Disease. Max. 30 points.)	Evenness. (Max. 20 points.)	Condition. Max 10 points.)	*Cleanliness. †(Max. 30 points.)	Total Points.
G. Gow, Hughenden, Barellan.	Barellan ...	Yandilla King ...	Fallowed 1930; ploughed 4 inches July - August, 1931, springtoothed twice in September, and February and April, harrowed after sowing.	Early April.	lb. 60	lb. 56	Old land.	inches. 8·76	47	18	29½	16	9	29	148½
W. Hendy, Browley, Corobimilla.	Narrandera	Ford	Disced March, springtoothed April, ploughed 3½ inches July, harrowed August; crop fed back June.	12th May	52	35	Very old land.	...	42	17	29	19	9	29	145
J. W. Gooden & Sons, Glenroy, Lockhart.	Lockhart ...	Yandilla King ...	Ploughed June-July, 1930, scarified September, harrowed December, scarified March, 1931, disced August, scarified October, harrowed December, springtoothed February.	Mid-April	60	70	Over six.	...	41	18	29	18	9	27	142
D. Bolte, Lincluden, West Wyalong.	West Wyalong.	Nabawa ...	Scarified 4 inches August, disced September and February, harrowed before sowing.	25th April	70	45	Seven.	8·09	34	19	29	19	9½	29½	140
J. W. Hawthorne, Uley, Ardlethan	Ardlethan	Waratah ...	Ploughed 3½ inches June, 1930, harrowed September, springtoothed October and March, ploughed 3 inches September, harrowed November and March.	Mid-May	70	60	Old land.	...	40	18	28	15	9	29	139
P. L. Lord, Dooling Dooling, Urana.	Bidgeemia	Bobin	Disced February, ploughed 4 inches August, smoozed and scarified October, scarified February and March and May, harrowed May.	Second week May.	75	90	Over six.	...	36	19½	26	19	9	29	138½

S. Rhodes, Eden Park, Coreen.	Oaklands ...	Free Gallipoli ...	Ploughed 4 inches August, 1930, springtoothed October, December, April, ploughed 4 inches September, 1931, harrowed October and March.	5th April	60	60	Over six.	...	37	19	27	19	9	26	137
H. A. Davey, Los Angeles, Ariah Park.	Ariah Park	Bena	Ploughed 3½ inches July, springtoothed September, harrowed February.	12th April	56	60	Very old land.	...	39	17	27	19	9	26	137
G. Maguire and D. Fehon, Aorangi, Barmedman.	Barmedman	Bobin	Ploughed 2½ inches July, springtoothed September and March.	28th May	50	50	Old land.	10·89	39	16½	26	16	8	29	134½
H. E. Barker, Glengower, Mayrung.	Deniliquin...	Nabawa ...	Ploughed 4 inches July, disced October, March, springtoothed April; crop fed back until early July.	Mid-May	70	Nil.	Over six.	...	33	18	27	18½	9½	27	133
G. Z. Jasper, Lone Pine, Walliston.	Walliston ...	Rajah	Ploughed 4 inches July, springtoothed October and February, harrowed March, smooged before sowing.	11th and 12th May.	75	75	Fifth crop (after six years' spell).	8·58	39	17	26	17	8	26 (28)	133
J. Deegan, Mallowdine, Goolgowi.	Griffith ...	Bobin (26 acres), Nabawa (6 acres), Geeralying (18 acres).	Ploughed 4 inches July, springtoothed September and March.	27th and 28th April.	50	50	Sixth.	9·85	33	18	25	19	9	27½ (29)	131½
C. R. Moulton, Dundaraga, Berrigan.	Berrigan ...	Penny	Ploughed 4 inches July-August, harrowed August, disced October, harrowed April.	Mid-April	45	56	Very old land.	...	36	17	20	17	9	27	126

* First Crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

‡ Where less than than 30, maximum is shown in parentheses.

A Very Favourable Season.

In the following table is shown the total rain during the fallow period and the monthly registrations during the growing period in the different districts from records supplied by the Weather Bureau. For comparative purposes, the average rainfall for the growing period is also given:—

RAINFALL TABLE.

District.	Fallow Period. (June, 1930, to March, 1931.)	Growing Period.								
		April.	May.	June.	July.	August.	September.	October.	Total.	Average.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
West Wyalong	1,698	295	108	132	135	230	285	55	1,240	1,037
Barmedman ..	1,282	328	72	102	137	234	167	12	1,052	1,100
Ariah Park ...	1,349	256	56	149	142	239	145	79	1,066	1,150
Ardlethan ...	1,349	268	78	160	120	282	161	57	1,126	1,178
Barellan ...	1,137	333	54	111	85	258	190	27	1,058	1,031
Griffith ...	1,424	256	47	112	103	261	186	16	981	1,074
Narrandera ...	1,586	256	87	163	136	291	171	48	1,152	1,108
Deniliquin ...	1,412	244	59	161	228	245	163	68	1,164	1,062
Berrigan ...	1,279	294	38	168	198	289	218	102	1,307	1,169
Oaklands ...	......	355	18	225	172	317	144	9	1,322	1,167
Lockhart ...	2,075	256	30	264	128	306	115	132	1,231	1,218

For the second year in succession a very favourable season was experienced in this part of the wheat belt. The aggregate rainfall during the fallow period approximated closely to the average, but fully one-third of the total was registered during the first month of the period, and the summer generally was dry and extremely hot. For weeks on end the thermometer recorded a temperature in the vicinity of 100 deg. Fahr., and as the result of the prolonged period of intense heat and the continued absence of serviceable rains, the soil became extremely dry and hard, but satisfactory rains were experienced in March and April, which provided excellent conditions for the preparation of the land for sowing, and thus the season opened favourably. The total rainfall during the growing period just about equalled the average; following above-average rains in the middle of April, a dry spell of some weeks was experienced, the May registration being much below normal, and only light showers that were not of great service were experienced during the months of June, July and early part of August, but substantial rains fell at the end of August, when the crops were most in need of it. This rain was of a very beneficial character, considerably improving the prospects, and following further good rains in September, luxuriant growth was made by the crops and the production of high yields was assured.

Cool weather during the spring months was ideal for ensuring the development of a plump grain, and as a result an excellent sample of grain was produced. Many of the crops were so heavy that lodging resulted.

The Leading Crops.

The prize-winners in the championship were:—

1. G. Gow, "Hughenden," Barellan (Barellan Society).
2. W. Hendy, "Browley," Corobimilla (Narrandera Society).
3. J. W. Gooden and Sons, "Glenroy," Lockhart (Lockhart Society).

In the accompanying table are set out the points awarded each competitor, together with particulars of the cultivation methods and varieties:—

This is the third occasion in the four years since the districts in the wheat belt were re-grouped for the purpose of these competitions that the championship has been awarded to a crop submitted by the Barellan Agricultural Society, and it is the second time that Mr. Gow has won the distinction of champion, and as on the previous occasion he again pinned his faith to the Yandilla King variety. The crop was one of the heaviest which has ever been inspected; about 5 feet high, it combined density with good ear development, and was estimated to yield 47 bushels per acre. Disease and weeds were almost entirely absent, but, as might be expected with such a bulky crop, lodging had occurred in patches. The soil on which the crop was produced is a fertile, self-mulching grey loam, which in its virgin state had been timbered with belar, box and pine. The excellent result achieved can be attributed to the sound judgment shown in the performance of the various cultural operations, and in no small measure to the well-directed warfare which is continually waged on weeds on this property.

The crop which won the second prize was a tall dense crop of Ford, which was uniformly well headed, and estimated to yield 42 bushels per acre. It was notable for its freedom from disease, but failed to reach pure seed standard owing to the presence of variants. For land which had been under cultivation for very many years it was remarkably free from weeds, no doubt due to the fact that the land had been treated to a long summer fallow.

The third-prize crop was a fine crop of Yandilla King, which was well headed and for the most part very dense, but varied somewhat in this respect, the average yield being estimated at 41 bushels per acre. Except for a trace of foot-rot and loose smut, the crop was clean as regards disease, and was sufficiently free from strangers to pass as pure seed, but a detracting feature was the presence of saffron thistles. It was stated that the paddock was previously very badly infested with this weed, and it is evident that much had already been accomplished in its eradication by cultivation.

Lessons from the Season.

Fallowing.—Four crops were grown on land which had been fallowed in the winter of 1930, and thus had been under fallow for nearly two years; all of them were high yielding crops, three being estimated to yield 40 bushels per acre and over, evidently due to the benefit of the additional moisture stored in the soil and the increased production of nitrates during

the prolonged period of fallow. It would certainly not be economic deliberately to leave land out to fallow for this long period, but in this instance it was a matter of compulsion, as the land was fallowed with the intention of sowing in 1931 and owing to the excessive rains during the autumn of that year it was not in a suitable condition to proceed with seeding operations, and consequently it was necessary to leave it out of crop for another year.

The importance of ploughing the fallow early has been well recognised, and in spite of the very wet conditions experienced during the early winter of 1931 the ploughing of all fallows had been completed in July, with the exception of one, which received its first cultivation in August. By ploughing early, the land is put in a receptive condition to absorb the winter rains, and thus more moisture is conserved in the soil and the other benefits of fallowing are increased. In consequence, better yields result from fallowing early in June or July than if the ploughing is left until the spring.

Two competitors treated the land to a long summer fallow by discing in February and March, 1931, and then ploughing in July or August. This practice has much to commend it, and is of especial value in the control of weed growth.

The very essential cultivation of the fallows in the spring months had been attended to by all competitors, and owing to a comparatively dry summer in most districts, subsequent cultivations to keep the fallows free from weeds were not necessary until February or March.

Varieties.—The season, with its ideal spring conditions, favoured the late-maturing varieties, and Yandilla King proved the most successful variety by accounting for the first and third prizes with the excellent yield of 47 and 41 bushels per acre, respectively. This variety will repay good treatment, for when sown reasonably early on well-prepared fallow it has the capacity for the production of bumper yields, but if insufficient provision is made for conserving moisture, or when not sown early enough, the ears are liable to be "tipped," and under these conditions is likely to be disappointing.

By winning the second prize in this competition for the second year in succession Ford must attract attention as a suitable variety for this part of the wheat belt. This mid-season variety also requires to be treated well; in northern districts where Ford was sown this year under all conditions there were reports that it did not satisfactorily withstand dry conditions, but the chief trouble was that the land in many cases had not received sufficient preparation. It is a showy variety which is inclined to grow over-tall and lodge, and for this reason it is advisable when rapid growth is made in the autumn to feed it back with sheep, as was done with the crop which won second prize. This crop, in common with all crops of the variety inspected this year, contained a number of variants, indicating that natural cross-fertilisation had taken place, and it is doubtful if seed of this variety that is true to type can be procured in New South Wales.

Nabawa did not show out as well as in other competitions, for the reasons that some heavy crops of this variety were badly lodged, and also the success of some crops was marred by infection by foot-rot. Nabawa is renowned for its resistance to some diseases, especially flag smut, but it appears to be particularly subject to infection by foot-rot.

Bobin was represented by two entries and half of another, but in each instance the crop was appreciably infected with flag smut and loose smut. The susceptibility of this variety to flag smut was demonstrated in its comparison with Nabawa and Geeralying in the composite entry containing these three varieties, the latter two being free from the disease. This is the first appearance of Geeralying in the competitions in this division; its chief merit lies in its immunity to flag smut. It is a very early maturer and requires sowing during the latter part of the sowing period. It is suitable for hay, and should be valuable for sowing on headlands. Rajah also has made its appearance for the first time. This variety has been under trial for many years, but although it has given some good returns it does not compare satisfactorily with Nabawa or Waratah. The only entry of Waratah filled fifth place with a very heavy crop which was estimated to yield 40 bushels per acre, but unfortunately had lodged badly.

The other varieties represented, namely, Penny, Free Gallipoli, and Bena, were all high-yielding crops which have shown merit by winning local competitions; the first-named was successful in winning the first and third prizes in the previous year's competition, and also formed part of the first prize crop in 1930, but in this year's entry infection by diseases ruined all chance of success.

Seeding Operations.—The time of sowing varied from early April to the end of May, which may be regarded as the safe limits for the sowing period in these districts. The rates of seeding ranged from 45 to 75 lb. per acre, with an average of 61 lb. per acre, which is almost exactly the same as the rates adopted in the sowing of the competition crop in this division in the previous three years.

One competitor dispensed with an application of fertiliser for the reason that he was unable to finance the purchase of superphosphate. This is the only reason that should deter farmers in this division from applying superphosphate with the wheat crop, for as substantial increases in yield can be expected from it, particularly in the southern parts, it is short-sighted policy to neglect to use it. The quantity of superphosphate applied varied from 45 lb. to 90 lb. per acre, with an average of 59 lb. per acre. While this is an increase on the average quantity used in the previous year's competition, which was 52¼ lb. per acre, it is a material reduction on the average quantities applied in 1929 and 1930, viz., 79½ and 71¾ lb. per acre, respectively. The need for economy on account of low wheat prices and financial stringency is the chief cause of the general reduction of the quantity of superphosphate applied, and, moreover, heavy applications of superphosphate are not so profitable as when wheat prices were at a more satisfactory level.

Two crops were fed back by sheep; one was a crop of Ford, which variety is usually benefited by feeding back on account of its rapid early growth and good stooling capacity, and in this case it was evidently an advantage, as the estimated yield of the crop was 42 bushels per acre. The other instance was a Nabawa crop, which, on the other hand, was apparently at a distinct disadvantage by reason of having been fed back, for it lacked density and was rather badly infected with foot-rot. This variety, on account of its susceptibility to foot-rot, should not be fed back, for it is the general experience that feeding back increases the amount of damage from this disease.

Diseases.

The four leading crops were very disease-free. Although Yandilla King is not a resistant variety, the two crops of this variety were practically free from flag smut, and the same may be said of the crop of Ford. As is customary, there was no infection in the Nabawa and Geeralying crops, but all the other varieties were more or less infected. Speaking generally, flag smut appears to be on the wane, evidently as the result of the extensive cultivation of the resistant variety Nabawa, and its use in rotation is serving to starve the fungus which is in the soil in a similar manner as a rotation with an oat crop. As in previous years, foot rot was fairly prevalent in competing crops, and take-all also was in evidence in a few crops. The provision of a well-compacted seed-bed to ensure rapid germination assists in preventing infection of crops by the three diseases already mentioned, which are soil-borne, but when a crop is severely infected, the measures of control recommended are a good stubble burn and rotation with oats.

Bunt was detected in two competing crops, and as this disease is well within the control of the farmer, its presence in competition crops is regarded seriously, and a drastic reduction in points is made. In both instances the seed was stated to have been treated with copper carbonate; one competitor, farming on shares, admitted that the seed had been insufficiently dusted, and the other could advance no reason for the presence of the bunt. Since the introduction of the method of treating seed wheat with dry copper carbonate infection of wheat crops by bunt has been reduced to a minimum, but judging from reports received, there appears to be an increase of infected crops this year. The chief cause of the spread of the disease is the fact that some farmers during the past couple of years have dispensed with the treatment of the seed as a measure of economy, but such neglect should be termed false economy, as the cost of dusting is a mere bagatelle in comparison with the dockages imposed on smutted grain, and the infection will increase each year. Another cause is faulty treatment, such as unsatisfactory methods of dusting and insufficient quantity of powder (the full amount of 2 oz. copper carbonate should be used to every bushel); the seed should be treated by machines which will ensure that every part of every grain is thoroughly coated with the dust. Contract graders are sometimes responsible for "bunty" crops, insufficient

copper carbonate being supplied to dust the seed thoroughly, and occasionally care is not taken to ensure that the dust is being fed satisfactorily throughout the operations of grading and dusting.

Copper carbonate has proved very effective for the treatment of lightly-infected seed, and in eliminating even a slight trace of the disease, but there is no treatment that has given entire satisfaction in general practice for the treatment of badly infected grain, which should not be used for seed purposes.

The Central Slopes Area.

E. S. CLAYTON, H.D.A., Senior Experimentalist.*

There were thirteen entries for the Royal Agricultural Society's Cup for the champion wheat crop of 50 acres grown on fallowed lad. The competition was marked by particularly keen enthusiasm among the competitors. The crops were uniformly good throughout the whole area covered by the competition. Even in the Coonabarabran, Birriwa, and Mendooran districts, where the season was not particularly favourable, the crops were splendid.

The Season.

The rainfall on fallow and during the growing period is shown in the following table:—

RAINFALL Table.

District.	On the Fallow.	Growing Period.							
		April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Canowindra	1,100	343	66	163	100	266	270	127	1,329
Cowra	1,134	257	44	233	155	175	355	138	1,357
Cudal	1,400	278	32	159	122	140	342	182	1,255
Forbes	885	190	64	131	229	103	238	156	1,111
Grenfell	1,050	300	135	85	225	226	215	40	1,226
Quandialla	970	324	62	146	154	227	118	31	1,062

The autumn of 1932 was very favourable. Copious rains were received in April, and the sowing season was most propitious. As a result, the germination was exceptionally good. Early-sown crops came away quickly and grew rapidly until the severe cold of mid-winter checked their development. Late-sown crops germinated well, but did not make much growth until the weather became warm in the spring. During the winter exceptionally low temperatures were recorded, frosts were extremely severe and continuous. Although it was one of the coldest winters ever experienced in this part of New South Wales, very little damage was suffered by the

* Mr. Clayton judged the championship competition in this district.

crops, frosts in mid-winter, of course, being less dangerous than in the spring. A few crops were slightly affected by late spring frosts, but the damage was isolated and of no great significance. The presence of ample moisture in the soil all through the winter did much to lessen the effect of frost on the crops. Good rains were received in May, June, July and August, and in September very satisfactory falls were received; fair rain also fell at every centre in this district in October.

The weather experienced during September, October, and November was most favourable to the production of heavy crops. In the spring and early summer in normal seasons, the temperatures rise considerably, the atmosphere becomes dry, and hot drying winds are experienced. These factors shorten the ripening period and cause a reduction in yield. This season, however, the temperature remained, in the main, quite mild, sometimes definitely cool, and the atmosphere did not become excessively dry, consequently the evaporation of moisture from the plants and the soil was not high. There was also an almost complete absence of the hot, dry winds usually experienced. The result was that the ripening period was protracted, consequently the grain continued to develop for a longer period, and it became plumper and yields were greatly increased.

Unfortunately, very severe rainstorms occurred in November, and many of the heaviest crops were lodged to some extent. Although this detracted from their appearance, the grain in most of them ripened satisfactorily, and with modern harvesting machinery it is possible to harvest crops of this description without much loss of grain.

Farming Methods.

Mr. C. Taylor, of Cudal, won the championship by a margin of two points with a particularly good crop of Yandilla King, estimated to yield 38 bushels per acre. The crop was very satisfactory as a source of pure seed, and was clean and fairly free from weeds, wild oats, etc. It was remarkably even in density and height, and was almost free from disease. It was grown on a heavy red loam soil which originally carried white box and kurrajong timber. The land had been ploughed 5 inches deep with a mouldboard plough in September, then springtoothed twice in January to a depth of 4 inches, cultivated again (shallow) in March, and sheep were grazed on the fallow to control weed growth. The seed had been graded and treated with copper carbonate to prevent bunt, and was sown on 15th April at the rate of 60 lb. per acre with 50 lb. superphosphate. The germination was excellent, and the crop was well grown with the heads well filled and heavy.

Second place was filled by Messrs. Troy and Sons, of Quandialla, with a fine crop of Waratah. The land is a heavy black loam which originally carried white box, and had been mouldboard ploughed to a depth of 4 inches in July, scarified in October, again in February, stocked with sheep and sown with a combine on 18th May. Seed was sown at the rate of 52 lb.

per acre along with 40 lb. superphosphate. The purity of the seed was satisfactory and the crop was clean and showed very little disease. It was well grown and dense, and the heads were well filled.

Messrs. Walmsley Bros., of Grenfell, gained third place with a heavy yielding crop of Waratah. This crop was estimated to yield 40 bushels per acre. It was grown on a heavy red loam, which originally carried white box and pine. The land was mouldboard ploughed in September, harrowed in October, disced and scarified in January, scarified in March, again in May, and sheep were grazed on the fallow. It was sown on 6th May at the rate of 60 lb. seed per acre with 60 lb. superphosphate. This crop was very dense and well grown, but it suffered as a result of the bad weather experienced in November, and part of the crop was lodged.

How the Varieties Fared.

Practically all the varieties most suitable to the district were represented in the competition. Nabawa was well represented, so also were Waratah and Ford. There was also one crop of Yandilla King which won the competition, and one of Turvey and Marshall's No. 3.

Waratah was inclined to lodge, especially when the crop was heavy and the heads well filled. Nabawa also failed to stand up satisfactorily. Yandilla King stood up very well, and so also did Ford, except where the crops were particularly tall and heavy. This variety is rapidly gaining in popularity in the district, and it gives every indication of being particularly suitable.

General Comments.

Most of the fallows had been ploughed early, and much of the moisture from the rains during the winter of 1931 was conserved in the subsoil. This winter was very wet and the fallows carried a particularly good reserve of moisture. A few crops in the competition were grown on a two years' fallow, the land being too wet to sow in 1931. Such a method would, of course, never be adopted as a general practice, and it was only the unusual conditions obtaining in the winter of 1931 which made it impossible to sow those fallows.

After being ploughed in the winter, practically all the fallows were cultivated in the spring to conserve moisture. This spring cultivation is most essential for this purpose, and also to put the fallow in a suitable condition to allow the sub-surface to consolidate to form the seed-bed. The fallows were well worked in the autumn and prior to sowing. Combines were used for sowing in most instances, and gave very satisfactory results.

Wild oats were not particularly noticeable in the competition crops, but the season seemed to favour the growth of thistles, including black, variegated and saffron, and these were troublesome in some of the crops.

The amount of superphosphate applied to the crops was slightly reduced this season, and in two instances no fertiliser was used. The low price of wheat was chiefly responsible for this tendency. Fortunately, the extremely favourable season more than made up for any possible reduction in yields due to using smaller amounts of superphosphate.

Details of Awards—The Central Slopes Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per Acre.	Quantity of Superphosphate per Acre.	Number of Crops Grown Previously.	Rainfall during Effective Period (April to October).	Points awarded. Apparent Yield. (One point per bushel.)	Trueness to Type. (Max. 20 points.)	Freedom from Disease. (Max. 30 points.)	Evenness. (Max. 20 points.)	Condition. (Max. 10 points.)	*Cleanliness. (Max. 30 points.)	Total Points.
C. Taylor, Wallendoon, Cudal.	Cudal ...	Yandilla King ...	Mouldboard ploughed 5 inches deep September, springtoothed twice 4 inches deep in January and again in March. Sheep on fallow.	15th April	lb. 60	lb. 50	Old land.	...	38	18	28	19	9	27	139
Troy & Sons, Fairfield, Quandialla.	Quandialla	Waratah ...	Mouldboard ploughed July 4 inches deep, scarified October, again February. Sheep on fallow.	18th May	52	40	Old land.	...	38	18	27	18	9	27	137
Walmsley Bros., Warrunga, Grenfell.	Grenfell ...	Waratah ...	Mouldboard ploughed September, harrowed October, disced and scarified January, scarified March and again May. Sheep on fallow.	6th May	60	60	Old land.	...	40	18	27	18	6	27	136
James Rawthorne, Back Tomanbil, Forbes.	Forbes ...	Nabawa... ...	Mouldboard ploughed 4 inches deep August, springtoothed November, again March, harrowed March, combined April, again early May. Sheep on fallow.	17th May	68	71	Old land.	...	40	17	28	16	7	27	135
S. E. Barber, Uralla, Baldry.	Cumnock ...	Marshall's No. 3	Mouldboard ploughed 4 inches deep September, 1930, springtoothed February, 1931, again April, sundercut December, springtoothed April, pulverised April. Sheep on fallow.	10th April	60	56	Old land.	...	39	18	26	18	7	27	135
F. W. Harding, Redlands, Billimari.	Cowra ...	Ford	Disc-ploughed September 4½ inches deep, harrowed January, disced January, springtoothed March. Sheep on fallow.	3rd May	60	56	Old land.	...	39	18	28	18	5	27	135

J. W. Eade, Ede Vale, Enchareena.	Molong ...	Nabawa...	... Mouldboard ploughed 4½ inches deep, springtoothed April, springtoothed May, mouldboard ploughed August 4½ inches deep, springtoothed November, December, January, again March, again May. Sheep on fallow.	23rd May	53	56	Old land.	...	36	19	27	18	6	27	133
O'Brien Bros., Glenmore, Suntop.	Wellington	Ford ...	... Mouldboard ploughed June 4 inches, harrowed December, springtoothed January, harrowed and springtoothed March, harrowed April. Sheep on fallow.	25th April	70	40	Old land.	...	34	16	29	18	8	27	132
W. Whitlock, Burrill Banks, Alectown.	Parkes ...	Ford ...	... Mouldboard ploughed 1930, 4½ inches deep, combined October, sundercut February, 1931, com bined April, sundercut August springtoothed October, sundercut March. Sheep on fallow.	2nd May	60	Nil.	Old land.	...	37	16	26	17	8	26	130
H. H. McDonald, Belmont, Lockwood.	Canowindra	Waratah	... Mouldboard ploughed August 4½ inches deep, disced September, springtoothed April, again May. Sheep on fallow. Harrowed after sowing.	16th May	70	45	Old land.	...	36	18	27	17	5	27	130
O. R. Gavin, Annaville, Mendooran.	Mendooran	Turvey ...	... Mouldboard ploughed 4 inches deep August, harrowed December, scarified January, harrowed January, and again after sowing. Sheep on fallow.	1st April	45	Nil.	First crop.	...	34	18	27	16	6	23	124
R. G. Norris, Morven, Binnaway.	Coonabarabran.	Nabawa	... Disced May 4 inches deep, discploughed October, harrowed February, springtoothed March.	12th May	48	56	2	...	31	18	28	17	7	23	124
F. H. Granger, Black Bull, Birriwa.	Birriwa (Agric. Bureau).	Nabawa	... Sundercut May, disced August, springtoothed October, again January, disced April. Sheep on fallow.	7th May	60	None.	4	...	28	17	26	16	6	25	118

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

The Southern Slopes Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

New records were established in respect of the number of societies that organised district competitions in this division, and also of the yielding capacity of the crops. The average of the estimated yields of the fourteen competing crops was 40 bushels per acre, which eclipses all previous results in these competitions. The leading crops were so uniformly good that the best seven could be separated by only four points in the awards. The district societies which conducted competitions were Albury, Boorowa, Coolamon, Cootamundra, Corowa, Culcairn, Galong (Agricultural Bureau), Henty, Murrumbidgee (Wagga), Murrumburrah, Temora, The Rock (Farmers and Settlers' Association), Yerong Creek (Agricultural Bureau), and Young. Judging was commenced at Corowa on the 28th November and completed at Cootamundra on 2nd December.

A Favourable Season.

The monthly rainfall registrations during the growing period in the different districts and also the total rainfall for the fallow period are set out in the following table:—

RAINFALL.

District.	Fallow Period (June, 1930, to March, 1931).	Growing Period.								Average rainfall for growing period.
		April.	May.	June.	July.	August.	September.	October.	Total.	
	points.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
Corowa	1,942	457	32	246	185	273	157	152	1,502	1,344
Albury	2,630	478	61	439	210	356	133	200	1,877	1,887
Culcairn	2,668	375	42	324	161	370	124	133	1,529	1,503
Henty	2,684	316	44	359	213	364	130	104	1,530	1,499
The Rock	2,176	359	71	264	162	369	75	181	1,481	1,364
Wagga	1,902	282	69	209	139	362	105	92	1,258	1,304
Coolamon	1,546	296	86	184	160	300	114	71	1,211	1,268
Temora	1,848	338	90	198	138	301	124	81	1,270	1,274
Young	2,448	290	85	208	207	285	308	70	1,453	1,604
Boorowa	2,025	259	59	183	207	287	209	85	1,289	1,398
Murrumburrah ...	2,301	366	85	306	197	295	180	66	1,495	1,486
Cootamundra	1,770	458	35	274	177	308	92	34	1,378	1,460

A favourable season was experienced in this division and at no time during the growing period did crops receive any severe check as in other parts of the wheat belt. The fallows carried a good reserve of moisture as the result of the conservation of the abundant rainfall of the previous winter, and good rains above the average in March and April supplied ideal conditions for sowing. The crops germinated well and did not suffer throughout their growth. Copious rains at the end of August, followed by a protracted cool spring, were very favourable to the final development of the crops and assured the production of high yields. Luxuriant growth was made by the crops, and in many cases crops lodged badly.

* Mr. Stening judged this championship competition.

Thee Leading Crops.

Particulars of the prize-winners are as follow:—

1. M. Muirhead, "The Allerton," Pleasant Hills (Henty Society).
2. C. D. Sanger and Son and D. O'Halloran, "South Wangamong," Corowa (Corowa Society).
3. D. A. B. Gibbs, "Oak Hill," Culcairn (Culcairn Society).

Details of the awards and of the cultural methods of each competitor's crop are shown in the accompanying table.

The Championship was won by a fairly dense crop of Nabawa, the ears of which were very well developed, and it was estimated at time of judging to yield 42 bushels per acre. The crop, which was produced on red loam, was standing well and comparatively safe from any damage, and disease was confined to a little foot-rot and loose smut. The presence of a few "strangers" and a little weed growth in the form of saffron thistles and wild oats somewhat detracted from an otherwise excellent crop.

The crop which won second prize was of the Yandilla King variety, estimated to return the high yield of 43 bushels per acre. Unfortunately, it was not quite up to the standard of pure seed, and a reduction of points was also incurred on account of the presence of saffron thistles.

The third prize was won by a very heavy crop of Turvey which had already lodged badly in parts. The estimated yield of 44 bushels per acre was the highest in the competition, and as no plants of any other variety were detected in the crop, it was awarded maximum points for purity. Although several fungous diseases were in evidence, such as flag smut, loose smut, take-all, foot-rot and stem rust, still the infection in each case was light, and no great damage had resulted. Considering that the land had been under cultivation for very many years, the amount of weed growth, consisting of wild oats and a few cockspurs and thistles, was not serious. The production of such a fine crop can be attributed to the excellent farming methods which are practised; not only was the fallow well cultivated, but a definite system of rotation with oats is followed.

Cultural Methods.

The production of high yields by the crops in this competition is an indication of the success that has been attained by the competitors in their application of scientific methods of cultivation.

The excessive rains which were registered during the early winter months of 1931 prevented early fallowing, except in very well drained situations or on porous soils, but in spite of this all fallows except two had been ploughed by August. In two instances the land had been under fallow since 1930, for the reason that it could not be sown in 1931 owing to the saturated condition of the soil.

It would be an advantage if more attention were given to the spring cultivation of the fallow. This is considered to be of the greatest importance, as it prepares the foundation of the seed bed, and as little rain is normally

experienced during the summer in southern districts, the cultivation should be performed early in order to ensure that the soil is satisfactorily compacted before the sowing period arrives.

It is interesting to note that five of the competing crops, including those which won first and third prizes, had been grown in rotation with oats. There are indications of a need for a more general adoption of this practice. One of the main yield-reducing factors this season in this part of the wheat belt was infection of crops by foot-rot, take-all, and, to a less extent, by flag smut, and the chief method for the control of these soil-borne fungous diseases is to spell the land from wheat crops by rotating with oats, which crop is not subject to infection by these diseases.

The prevalence of weed growth, such as wild oats and Cape weed, was also responsible for the reduction of yield of some crops, and one of the most satisfactory methods for dealing with wild oats is to grow oats solely as a fodder crop in the rotation. When the oat crop is utilised for grazing with sheep, and the crop residues and sheep droppings ploughed in about September, not only is weed growth controlled, but the practice assists in restoring humus to the soil and thus improving its fertility and physical condition.

Varieties.

The varieties which figured almost exclusively in this competition were Yandilla King, Nabawa, Waratah and Turvey, and their success in recent years indicates the suitability and commercial value of these varieties for the soil and climatic conditions of this division.

Yandilla King, by winning the second prize, and being represented in more entries than any other variety, upholds its reputation as the most successful variety in these areas.

Nabawa has repeated its success of the previous year and also of 1929 in again carrying off the Championship, and, as the season was more favourable for late-maturing varieties, its success is all the more creditable. Weakness of straw is a defect of this variety, and tall crops were damaged by lodging, otherwise it would probably have been even more prominent in the competition.

Turvey.—Judging by the excellent yields of the two competing crops of Turvey, namely, 44 and 42 bushels per acre respectively, the season was evidently favourable to this variety. Usually Yandilla King can be depended upon to give better results than Turvey, but in the more eastern portions of this division, where cooler conditions with heavy dews are experienced, difficulty is sometimes met in the threshing when harvesting crops of Yandilla King, which holds its grain rather tightly, and for this reason either Turvey or Marshall's No. 3 is preferred. Turvey, however, is definitely weaker in the straw and more susceptible to diseases.

Waratah is the only early-maturing variety which appeared in this competition, and considering that the season was so favourable for late-maturing varieties it gave quite a good account of itself. Two of the crops were very heavy, but unfortunately had lodged badly.

Seeding Operations.

The time of sowing of the competing crops varied from the first week in April to mid-May, which corresponds with the period during which the crops were sown in the previous year's competition. The optimum period for sowing in this district, however, may be taken as from mid-April to the end of May, with the proviso that if the seed-beds are well supplied with moisture the period may be advanced a week or two. In the past two seasons good rains were experienced in March, which ensured moist seed beds and thus early sowing was an advantage; moreover, certain factors operated against the success of crops sown late in May; for instance, in the previous season sowing had to be suspended during this time owing to the boggy condition of the soil, and this season the reverse was experienced, for owing to a deficiency of moisture, germination and early growth of the crops sown late in May were not as satisfactory as those sown earlier.

The quantity of seed per acre sown ranged from 55 to 80 lb., with an average of 66½ lb., which is 4 lb. more than the average in the previous year's competition. It is considered that the rate of 80 lb. is rather too heavy, except for the late sowing of a variety of poor stooling capacity, but it is preferable to err in sowing too much rather than too little, for a stand that is too thick may be remedied by harrowing the crop, whereas if a stand is too thin, it cannot be satisfactorily improved.

The application of superphosphate ranged from 50 to 112 lb. per acre, with an average of 65 lb., which is an improvement by 11 lb. per acre on the average application of the previous year, but still a decrease of 16 lb. per acre on the average quantity applied in the competition of 1930. With the present low prices of wheat, heavy applications of superphosphate are not as profitable as when prices were at a more satisfactory level, and under the circumstances a rate of 70 lb. superphosphate per acre can be accepted as a good average application in these districts, to be varied according to the nature of the soil and time of sowing; the quantity to be increased for light soils and late sowings.

In at least two instances there was evidence of carelessness in performing the operation of drilling; wide spaces were left unsown between drill-widths, thus providing a greater chance for weeds to flourish. Furthermore, straight drilling, with the regulation 7 inches between each stroke of the drill or combine, is more economical; for instance, if a space of one hoe is missed with a seventeen-hoe drill, it is equivalent to a loss of 1 bushel in every seventeen.

Foot-rot the Most Prevalent Disease.

The most prevalent disease was foot-rot, and scarcely any crop in the competition escaped infection. Take-all was more prominent than it has been in recent years, and the two crops which incurred the most damage from this disease were grown on fallows which were ploughed late in September, when the soil was dry. It has been frequently observed that the cultivation of the soil when in a dry condition was conducive to attacks

Details of Awards—Southern Slopes Wheat Area.

Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Seed per acre.	Super-phosphate per acre.	No. of Crops grown previously.	Points Awarded. Apparent yield. (One point per bushel).	Trueness to Type. (Max. 20 pts.).	Freedom from Disease. (Max. 30 pts.).	Evenness. (Max. 20 pts.).	Condition. (Max. 10 pts.).	*Cleanliness. (Max. 30 pts.).	Total Points.
M. Muirhead, "The Allerton," Pleasant Hills.	Henty ...	Nabawa ...	Skim-ploughed May, ploughed 4½ inches September, harrowed November, springtoothed February and March.	1st May...	lb. 60	lb. 60	Over six.	42	18	28½	19	9	26½‡	143
C. D. Sanger and Son, and D. O'Halloran, "South Wangamong," Corowa.	Corowa ...	Yandilla King ...	Ploughed 4 inches July–August, harrowed after ploughing, disced October, springtoothed January.	Mid-April	60	60	Very old land.	43	17	28	18	9	27	142
D. A. B. Gibbs, Oak Hill, Culcairn.	Culcairn ...	Turvey	Ploughed 4½ inches August, springtoothed November, scarified January, harrowed January, scarified April, harrowed before drilling. Crop harrowed August.	Early May	80	112	Very old land.	44	20	26½	15	8	27½	141
Estate of H. B. Koetz, "Clarence Vale," Wagga.	Wagga ...	Nabawa (30ac.) Waratah (20 ac.).	Ploughed 4½ inches July, cross-harrowed March, scarified April.	Early May	80	67	Very old land.	39	18½	28	18½	9	27	140
J. and T. V. McCaig, "Hope Vale," Coolamon.	Coolamon ...	Yandilla King ...	Ploughed 4 inches June, springtoothed September and in February.	1st week April.	56	60	Very old land.	37	18½	29	19	9	27	139½
J. D. Crowley & Son, "Victoria Park," Old Junee.	Temora ...	Yandilla King ...	Springtoothed 2 inches March, and again in June, ploughed 5 to 6 inches July, harrowed October, springtoothed November and April.	End April	62	60	Seven crops.	39	19	26	18½	9	28	139½

C. W. Frohling, "Annie Vale," Howlong.	Albury ...	Turvey	Ploughed 4 to 4½ inches August, scarified November and April.	Early May	72	72	Very old land.	42	20	26	17	8	26	139
M. J. Kirwan, "Polygon Wood," Yerong Creek.	Yerong Creek (Agric. Bureau.)	Yandilla King ...	Ploughed 4½ inches April, harrowed after ploughing and in September, Scarified September, October and March. Crop fed back in June.	14th April	66	60	Seven crops.	40	15	28	16	9	29	137
H. Coddington and Sons, "Nhill," Young.	Young ...	Waratah (30 ac.), Bena (20 ac.).	Ploughed 4 inches August, harrowed October, scarified November, springtoothed March, harrowed March, springtoothed April.	Mid-May	65	60	Very old land.	36	19	29	19	9	25	137
R. and V. Bradford, "Hillview," Nubba.	Murrumburrah	Waratah ...	Ploughed 4½ inches June, harrowed September, springtoothed November, February and March. Crop fed back in July.	End April	60	60	Old land.	42	19	29	14	8	25	137
H. Storey and D. Clarke, "Iona," Illabo.	Cootamundra	Yandilla King ...	Ploughed 3½ inches July–August, 1930, disced March, 1931, ploughed 3 inches July, disced September, October, disced and harrowed before sowing.	Early May	75	60	Very old land.	41	19	29	16	9	22	136
A. A. Gorham, "Oak Hill, Boorowa.	Boorowa ...	Waratah ...	Ploughed 3½ to 4 inches September, springtoothed January, harrowed March, springtoothed end April.	1st week May.	55	63	Five crops.	40	19	25	15	8	27 (29)	134
W. A. Moiler, "Myarba," The Rock.	The Rock (F. and S. Assoc.)	Nabawa ...	Fallowed 1930, ploughed 5 inches, October, 1931, harrowed March, springtoothed end March.	Mid-May	70	65	Very old land.	39	16	28	16	8	26	133
S. T. Kelly and W. H. Woodhead, "Kellwood," Galong.	Galong (Agric. Bureau).	Nabawa (40 ac.), Yandilla King (10 ac.).	Ploughed 4 inches September–October, disced November and March.	Mid-May	70	50	Old land.	34	16	27	19	9	14	119

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

‡ In parenthesis is shown the maximum in each case where it is not 30 points.

by take-all. Flag smut was not so much in evidence as in previous years, probably as the result of the seed beds being well compacted by the copious rains in March and early April. For the three diseases already mentioned, which are soil-borne, the best measures for control are the adoption of good farming methods, namely, the rotation of crops, and the preparation of a firmly compacted seed-bed.

Every competitor treated his seed wheat with copper carbonate, and in no instance was bunt detected.

As in the preceding year, loose smut was much more prevalent than is customary. This disease has been regarded by some to be of only minor importance, but there has been evidence, particularly in the last two seasons, that loose smut may account for very material reductions in yield. Infection takes place at the flowering stage, and the fungus remains dormant in the grain until after germination; therefore, the ordinary treatment with fungicides as for bunt is of no avail in the prevention of loose smut. To destroy the fungus inside the grain, treatment with hot water is required, which on account of the difficulties involved in its effective application cannot be recommended as a general treatment by farmers, but it is the intention of the Department of Agriculture to apply this treatment to the stud seed in the early stage of raising pure seed wheat at its experiment farms. In the meantime the only practical method of prevention open to farmers is to use seed only from crops which are known to be entirely free from this disease. The prevalence of loose smut varies from season to season, according to whether conditions were favourable for infection of the grain in the previous year.

The Northern Wheat Area.

C. C. SPARKS, H.D.A., Manager, New England Experiment Farm, Glen Innes.*

Fifteen districts competed in the northern division championship for 1932, viz., Baradine, Bingara, Boggabri, Currabubula, Delungra, Gunnedah, Inverell, Manilla, Moree, Narrabri, Quirindi, Tamworth, Tambar Springs, Tareela Springs, and Wee Waa. Coonabarabran, which until last year was included in this division, was transferred to the central slopes division, but the entry of Baradine kept the number of competitors up to that of 1931.

The results are as follows:—

1. Messrs. J. B. White and Sons, "Braymont," Boggabri; 140 points.
2. Messrs. Waddell Bros., "Glen Gowrie," Oakwood, Inverell; 139½ points.
3. Mr. W. E. Tonkin, "Myee," Pallamallawa, Moree; 138½ points.

Messrs. White and Sons' entry of Geeralying, Nabawa, and Waratah was a crop of very outstanding merit. It was grown on a self-mulching black loam under cultivation for twenty years. Details of the cultural

* Mr. Sparks judged the championship competition in this district.

operations are shown in the table overleaf. The Geeralying and Nabawa portions of the crop had been closely fed off by sheep in late July and on date of inspection were standing perfectly; the Waratah portion, however, had not been fed off and had lodged in small patches due to a heavy rainstorm of a few days earlier, although it was unlikely that any would be lost in harvest. The "Braymont" crop had all the attributes of a champion crop; it was very dense, well headed, pure and true to type, and averaging almost thirteen bags. It carried a trace of loose smut and stem rust, but was otherwise disease-free. An odd thistle and black oat comprised the weed population, but the condition of the crop was very satisfactory on this score, particularly as upwards of twenty crops had been grown on this paddock. Messrs. White and Sons have always specialised on long fallow, and this factor has been largely responsible for the success of their 1932 effort.

Messrs. Waddell Bros.' crop of Ford was on black basalt loam, now cropped for the sixth time. The paddock was under wheat in 1931, and following a stubble burn in January of this year was mouldboard ploughed and harrowed in February, scarified in April and again in May and harrowed, sown in early June with 60 lb. of seed per acre and harrowed. This was a remarkably fine crop, although very green when inspected. Type and purity were perfect except for the presence of very odd "strangers." The crop was standing perfectly, very well grown and dense and very even, except for one low-lying corner of the paddock, where the growth was lighter than the average. As regards disease the crop carried some foot-rot and a trace only of leaf rust, and a slight deduction was suffered, due to a few black oats and a trace of variegated thistle and dock. The apparent yield of this crop was 43 bushels—the highest in the championship.

Mr. Tonkin's crop of Ford was on grey loam on brigalow, belar, and wilga country now cropped for the eighth time in eight years. Last year's crop was oats which was partly fed off and partly cut for silage. In preparation for the present wheat crop the paddock was worked by rigid-tine cultivator in September and again in December of last year and sown and harrowed in mid-April with 48 lb. of seed. The crop was well grown and had made a wonderful response to the September rains. It was well up to pure-seed standards, but was a little lacking in evenness and showed a fair number of green heads due to delayed germination. Like the Boggabri crop, it carried a little loose smut and stem rust, but was otherwise disease-free and also equalled the winner as regards weed freedom. This crop was fairly heavily grazed during May, 1,200 sheep being run on 90 acres for three weeks.

The Season.

The summer of 1931-32 was hot and dry, but good rains in mid-March, ranging from 1½ inches upwards, saved the situation on the short fallow. Germination was generally good in the northern areas, except in certain localities where seed-beds were a little dry. The May-August period was

very dry, but good rain fell in mid-September, reaching 4 inches at Manilla, and very favourable growing conditions obtained throughout the territory until the end of the season. The break in the dry period was in time to save the crop in the earlier parts, and in later areas was opportune to produce high yields.

RAINFALL TABLE.

	Fallow Rain-fall.	Rainfall during growing period.							
		April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Boggabri	1,243	148	90	106	76	50	338	150	958
Gunnedah	340	136	139	106	210	82	380	35	1,088
Currabubula	822	134	69	122	125	87	387	182	1,106
Manilla	266	144	40	60	90	45	404	281	1,064
Tamworth	...	160	56	72	139	178	384	301	1,290

Ford the Most Popular Variety.

The fifteen entries were made up of twenty-one crops and among them Ford appeared nine times, Waratah four and Nabawa three. The preponderance of Ford was not quite so great as in 1931, but it was easily the most popular variety in the northern championship this year. While objections are raised to the baking characteristics of Ford, its agronomic attributes are such as to make it very desirable for the north, and its popularity shows no sign of waning. The most interesting point as regards varieties was the appearance of Geeralying, which provided portion of the winning crop. This is a very well-known Western Australian wheat, which, as is usually, the procedure has proved itself per medium of the local farmers' experiment plots. It is a high-yielding early maturer, tall growing, and while probably less rust resistant than Nabawa, is believed to be almost immune to flag smut. It should be a very suitable wheat for this territory.

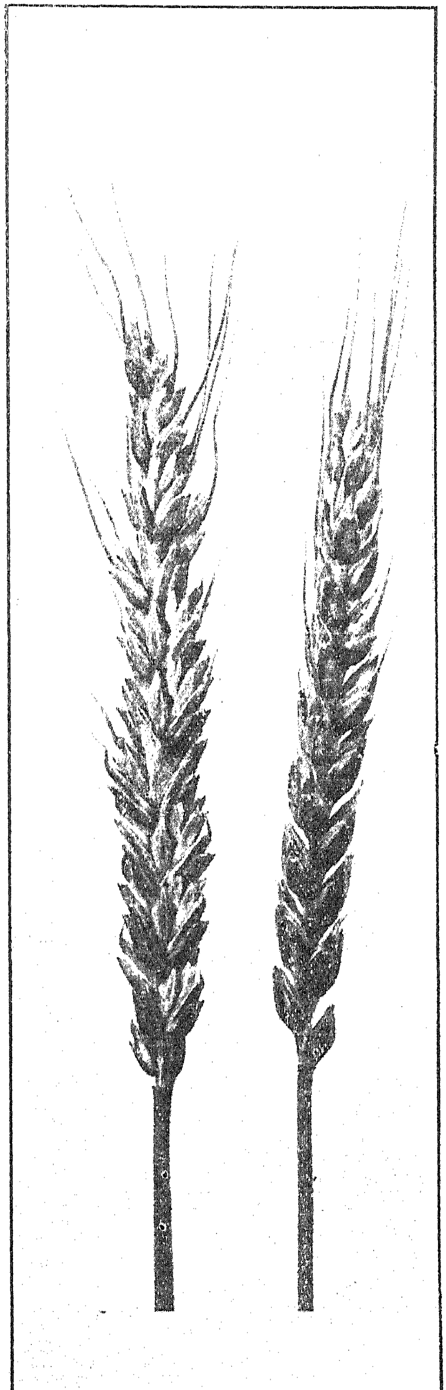
Diseases Fairly Prevalent.

There was an appreciable amount of disease present in the crops. The most healthy crop was that at Narrabri, which was exceptionally clean, but on the whole disease was fairly prevalent. Loose smut made fairly frequent appearances, and is worthy of increased attention from northern farmers. Treatment for loose smut is impossible with large bulks of seed, although it is being dealt with on the various experiment farms which specialise in wheat production, but in the meantime it will be advisable to refrain from drawing seed supplies from badly-affected crops. Flag smut was not unduly troublesome, and ordinary care should be sufficient to keep this menace within bounds, but apparently foot rot is steadily increasing and is causing some concern. The most obvious treatment for flag smut and foot rot is ʼnng bare fallow and the increased use of oats as a grazing crop, and for for feeding to horses working the wheat lands. Bunt was absent, and

in every case seed treatment by dusting with copper carbonate had been practised. A little rust (leaf and stem) was present in nearly all crops, but as this is largely beyond the control of the grower the penalty was very light.

Cultural Operations, etc.

Seeding rates ranged from 39 to 60 lb. per acre and averaged 45 lb. All seed was graded and dusted and none of the crops was manured. The fifteen entries gave an average apparent yield of upwards of twelve bags per acre. Sixty per cent. of the entries were April sown and the majority were grazed by sheep during the winter. There has of late been a marked tendency towards earlier sowing and feeding off, and in a season such as the past the practice has proved most successful. When the weather broke at the end of the long dry winter period the crops on fallowed land looked well enough to produce good yields, but others were in bad shape and had the finish of the season been less beneficial failure would have been rife. Such, however, is the extraordinary fertility of these northern soils that with the favourable growing conditions of September-October almost all crops made a complete recovery. As usual, the amount of tillage required to produce high yields was trivial. At Pallamallawa (Moree) two cultivations in September and December produced a 38-bushel yield. At Quirindi two cultivations only of stubble gave 39 bushels per acre. At Bingara a December discing gave 34 bushels, and at Manilla land disc-ploughed



Ford.

AWARDS in the Northern Wheat Area Championship.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per Acre.	Quantity of Superphosphate per Acre.	Number of Crops Grown Previously.	Rainfall during Effective Period (April to October).	Points awarded. Apparent Yield. (One point per bushel.)	Trueness to Type. (Max. 20 points.)	Freedom from Disease. (Max. 30 points.)	Evenness. (Max. 20 points.)	Condition. (Max. 10 points.)	*Cleanliness. (Max. 30 points.)	Total Points.
					lb.			points.							
J. B. White & Sons Braymont.	Boggabri ...	Geeralying. Nabawa, Waratah.	Ploughed (mouldboard) July-August, springtoothed February, harrowed March and April.	2nd to 6th May.	42	Nil.	Old land.	810	39	18½	28	19	7½	28	140
Waddell Bros., Glengowrie, Oakwood.	Inverell ...	Ford	Ploughed and harrowed February, scarified April-May, harrowed.	Early June.	60	Nil.	5	...	43	19	26½	18½	6½	26	139½
W. E. Tonkin, Myee, Pallamallawa.	Moree ...	Ford	Scarified September and December	Mid-April.	48	Nil.	Old land.	...	38	18	28	18½	8	28	138½
R. S. Clayton, Dohbledah.	Gunnedah	Ford	Ploughed (disc) August-September, harrowed December, skim-ploughed January, harrowed February-March, springtoothed April.	3rd April	45	Nil.	1	1,088	41	18	29	19	7½	23½	138
T. & D. Scott, Aberfeldie.	Currabubula	Nabawa ...	Ploughed (mouldboard) November, springtoothed December, harrowed March.	22nd April	45	Nil.	Old land.	1,106	36	19	28	18½	8	28	137½
W. McInnes, Dalmore.	Quirindi ...	Duri, Hard Federation.	Scarified February-March (portion twice).	24th May	45	Nil.	Old land.	...	39	18½	28	18½	8	25	137
Egbert Wyndham, Daruka	Tamworth	Waratah ...	Ploughed (mouldboard) March, springtoothed April.	End May	50	Nil.	2	1,290	40	18½	27½	18½	8	24	136½
J. W. Wall, Stony Creek.	Narrabri ...	Ford	Half area ploughed (disc) October, remainder springtoothed and harrowed February.	20th March.	41	Nil.	Old land.	...	36	18½	29½	17½	9½	25	136
J. Mahady, The Wilgas.	Delungra ...	Waratah, Ford...	Ploughed (mouldboard) January, harrowed twice February, springtoothed March.	Mid-April	39	Nil.	Old land.	...	40½	16	27	18½	7	27	136
R. J. Greer, Forest Glen.	Manilla ...	Currawa ...	Ploughed (disc) March, harrowed April.	18th April	56	Nil.	4	1,064	39	18½	27	18½	8	24½	135½
J. Bunner, Woodbine.	Baradine ...	Ford	Portion disced, remainder scarified February.	Late April.	40–44	Nil.	6	...	34	18	27	18½	9	28	134½
G. F. Gray, Hawthorne.	Wee Waa ...	Ford, Hard Federation.	Disced January, springtoothed March.	Late April	45–58	Nil.	Old land.	...	32	18	28½	18	9	26	131½
F. R. King, Yeral.	Bingara ...	Ford	Disced December	Mid-April	42	Nil.	Old land.	...	34	17	28	18½	7½	26	131
J. P. Weis, Leona Downs.	Tareela Springs.	Nabawa ...	Scarified February and April ...	26th April	45	Nil.	Old land.	...	28½	17	28	16½	7	26	123
F. J. Simmons, Merry Bow.	Tambar Springs.	Ford, Waratah...	Ploughed (disc) January, scarified twice and harrowed March.	Early May	38	Nil.	6	...	29½	13	27½	16½	7	27½	121

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

March and harrowed in April returned 39 bushels. It is not suggested, however, that any lowering of the standards of cultivation should be considered, and in spite of excellent yields which a season with a benign finish and highly fertile soils have produced, our original recommendation must stand, viz., early summer fallow with an occasional long fallow (say, one in three) and the extended use of oats as a grazing and hay crop. Oats, March sown, and heavily grazed throughout the winter, and the land fallowed in spring for seeding to wheat the following autumn, is the ideal way to control weeds and soil borne disease in northern wheat fields.

The Western Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

DESPITE a rather abnormal season, the number of local societies which organised competitions was equal to the record number of the previous year, and the competing crops generally were of a high standard, as indicated by the average yield of over 34¾ bushels per acre.

Eleven societies were represented, namely, Bogan Gate, Cargelligo, Dubbo, Gilgandra, Hillston, Narromine, Peak Hill, Trundle, Tullamore, Tullibigeal (Agricultural Bureau), and Ungarie. Judging was commenced at Gilgandra on 7th November and completed at Hillston on 11th idem.

An Unusual Season.

The following table shows the rainfall registrations during the fallow and growing periods, as compiled from records of the Weather Bureau:—

District.	Fallow Period (June, 1930, to March, 1931.)	Growing Period.								
		April.	May.	June.	July.	August.	September.	October	Total.	Average for Period.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Gilgandra ...	1,728	147	52	106	149	94	291	117	956	1,245
Dubbo ...	1,979	224	29	95	96	115	461	36	1,056	1,228
Narromine ...	1,667	175	30	81	110	157	408	44	1,005	1,063
Peak Hill ...	1,680	219	99	97	124	198	234	126	1,097	1,170
Tullamore ...	1,510	202	133	91	87	201	353	61	1,128	1,038
Trundle ...	1,551	272	64	81	138	154	297	125	1,131	1,047
Bogan Gate	1,715	262	67	94	144	202	296	95	1,160	1,055
Tullibigeal ...	1,074	239	46	83	94	116	245	45	868	813
Cargelligo ...	1,215	368	30	56	98	166	300	19	1,037	912
Hillston ...	1,282	269	57	98	103	237	81	26	871	887
Ungarie ...	1,316	239	99	101	154	238	173	67	1,071	1,037

The seasonal conditions experienced in this Division were erratic, for although the aggregate rainfalls during both the fallow and the growing periods compared satisfactorily with the average registrations for these periods, still the incidence of the rainfalls was by no means favourable.

* This championship competition was judged by Mr. Stening.

For instance, the registrations during the months of June and December, 1931, and March, 1932, were for the most part more than double the average for these months, while a protracted dry period was experienced during the spring months, August, September, and October, 1931, and there was also a general lack of rain during January, 1932. The March rains were particularly useful in ensuring moist and compacted seed-beds, and also in germinating weed seeds. During the growing period also, similar "feast and famine" periods were experienced; the April rains were above average, but the registrations during May and June were abnormally low, and dry conditions ruled until the end of August. At this time the crops were suffering from lack of moisture, and particularly in the northern portion of this division many crops had depreciated to such an extent that they were considered to be beyond recovery, but light rains on the last days of August saved the situation, and further copious rains experienced in the middle of September completely altered the outlook. The September registrations were much above normal, and in many districts more than double the monthly average, and, although in the northern districts of Dubbo, Narromine and Gilgandra the crops were too far advanced to receive maximum benefit, still they made a most remarkable recovery and the failure of many crops was averted. Cool weather and absence of hot winds during the spring months greatly assisted in the production of good yields.

As the result of the erratic season a secondary growth occurred in many crops which had the effect of delaying harvesting operations, and the uneven ripening probably caused loss of grain with varieties which are liable to shed.

The Leading Crops.

The placings in the championship were:—

1. A. Scrivener, "Hildavale," Gunningbland (Bogan Gate Society).
2. M. Bryant, "Merrilea," Peak Hill (Peak Hill Society).
3. A. Ruschen, "Aldersyde," Girral (Ungarie Society).

Details of the points awarded in the judging and particulars of the cultural treatment of every competitor's crop are shown in the accompanying table:—

The crop which won the championship consisted of equal areas of the three varieties of Waratah, Nabawa and Bobin, grown on a black self-mulching soil which was previously timbered with belar. The three varieties were dense, well headed, and averaged about 5 feet high. The crop had already lodged in patches at time of judging. The average yield was estimated at 42 bushels per acre, the Waratah crop being adjudged the highest yielder. Take-all was present in the Bobin and Nabawa crops, and a small infection of flag smut in the Waratah, while the purity of all three varieties was of a high standard. A little weed growth in the form of wild mustard, wild oats and thistles, caused a reduction of points.

The second prize crop, which was of the Nabawa variety, was tall and dense, with very well-developed heads, estimated to yield 42 bushels per acre. The crop had lodged in parts, and second growth was in evidence

DETAILS of Awards—Western Wheat Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per Acre.	Quantity of Superphosphate per Acre.	Number of Crops Grown Previously.	Rainfall during Effective Period (April to October).	Points awarded. Apparent Yield. (One point per bushel.)	Trueness to Type. (Max. 20 points.)	Freedom from Disease. (Max. 30 points.)	Evenness. (Max. 20 points.)	Condition. (Max. 10 points.)	*Cleanliness. †(Max. 30 points.)	Total Points.
					lb.	lb.		inches.							
A crivener, Hildavale, Gunningbland.	Bogan Gate	Waratah (17 acres), Nabawa (17 acres), Bobin (17 acres).	Disc-ploughed 4 inches August-September, springtoothed January and April, harrowed April.	18th May	52	28	Old land.	12·67	42	19½	27	18½	8	27	142
M. Bryant, Merrilea, Peak Hill.	Peak Hill ...	Nabawa ...	Ploughed 3½ inches June, 1930, springtoothed August, October, 1930, and June, 1931, disced September, springtoothed and harrowed March, and after sowing.	4th May	60	56	Over 6	...	42	19	29	17	7	27	141
A. Ruschen, Aldersyde, Girral.	Ungarie ...	Nabawa (25 acres), Bobin (25 acres).	Ploughed 3½ inches June-July, springtoothed full depth October, springtoothed December and February.	First week May.	60	45	Over 6	9·89	37	18	29	17	9	29	139
N.H.Hubbard, The Wilgas, Wongarbon.	Dubbo ...	Ford	Disc-ploughed 4 inches early August, disced January, springtoothed March.	13th and 14th April.	50	Nil.	Very old land.	8·26	37	18	29½	19	9	24	136½
W. G. Williamson, Glenleigh, Yarrabandai.	Trundle ...	Bobin	Ploughed 4 inches June, disced October, springtoothed January.	24th and 25th April.	60	60	Old land.	12·41	37	19½	27	19	9	23	134½
W. R. Ireland, Yandiah, Tullibigeal.	Tullibigeal	Nabawa ...	Ploughed 4 inches May, springtoothed June and six times after, and then again before sowing.	Third week April.	53	35	Old land.	...	33	19	29	19	9	24	133
F. L. Elrington, Currawong, Narromine.	Narromine...	Yandilla King ...	Disc-ploughed 4 inches June, scarified August, October and before sowing.	mid-April	45	Nil.	Very old land.	9·03	32	18½	28	19	9	26	132½
R. McKenzie & Son, Camp Plain, Hillston.	Hillston ...	Yandilla King ...	Ploughed 4 inches July, springtoothed February.	mid-April	40	Nil.	5	8·75	39	15	25	18	9	26 (29)	132
J. A. Reberger, Travailler, Lake Cargelligo.	Cargelligo ...	Nabawa... ...	Ploughed 3½ inches August-September, springtoothed September, harrowed November, crop fed back July.	Early April.	60	Nil.	4	6·72	30	18½	29	17	9	26 (28)	129½
A. T. Reynolds, Blayak, Gilgandra.	Gilgandra ...	Turvey	Disc-ploughed 3½ inches August, scarified November, disced January, springtoothed with wide points March, cross-harrowed April.	Last week April.	52	Nil	Very old land.	...	24	19	29	19	8	27	126
W. E. Jones, Allawah, Tullamore.	Tullamore	Nabawa... ...	Disc-ploughed 3 inches September, harrowed October, springtoothed February.	Third week April.	50	50	First crop.	...	30	16	29	19	8	21 (24)	123

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. † Where less than 30, maximum is shown in parentheses

which would delay harvesting. The standard of purity was high, and the only disease present was some stem rust, but the crop was too far advanced to incur any damage. The soil was a chocolate loam which previously carried box, buddah and wilga. The land had been fallowed in June, 1930, but owing to the excessive rain it was impossible to sow in 1931.

Nabawa again figured, in conjunction with an equal area of Bobin, in the crop of the third prize winner. There was a slight infection of flag smut and loose smut in the Bobin crop, whereas the Nabawa was practically free from disease, and, moreover, the latter was standing up much better than the Bobin crop. Both areas were of pure seed standard, comparatively free from weeds, and estimated to yield 37 bushels per acre. The soil is a friable chocolate loam which formerly was timbered with pine, box and boree.

Lessons of the Season.

Fallowing.—The practice of fallowing considerably assisted crops to hold out during the protracted dry period in the winter, and enabled them to benefit from the saving rains at the end of August and in September. Generally speaking, the fallowing methods adopted by the competitors were of a high standard consistent with the peculiarities of the season. Some fallows were ploughed later than would have been desirable under normal conditions, but the superabundant rains which were experienced from March to June, 1931, caused the land to become waterlogged in many instances and prevented the satisfactory ploughing of the soil at an earlier date. More harm than good would have resulted and needless expense would have been incurred if the land had been ploughed when it was too wet, for the soil becomes puddled and dries out with a brick-like hardness, in which state it is difficult to restore to a satisfactory physical condition even with many cultivations. It is very inadvisable to plough the land when it is not in a suitable condition.

The depth of ploughing varied from 3 to 4 inches, and it would not have been an advantage to plough any deeper; in the drier districts, if the land is ploughed too deeply, there is a probability that insufficient rain might be received to compact the seed-bed thoroughly. The aim should be to ensure a firmly compacted seed-bed by sowing time, for by this means the amount of moisture per unit volume of soil is increased, and the moisture is more readily available to the young roots of the crop.

Varieties.—Nabawa was again the most successful variety in the competitions, appearing in the three winning crops and being represented in more entries than any other variety. This is the fourth consecutive year that Nabawa has filled the two leading places in the championship in the western wheat area, and this splendid performance places the hallmark on it as the most suitable variety for the climatic conditions experienced in this division. As the result of its success in these competitions, its popularity has rapidly increased, and it is now by a very large margin the most extensively grown variety in this part of the wheat belt. It again confirmed its reputation for resistance to flag-smut, and also as a drought-resister.

This is the first occasion that Bobin has figured in this competition, and it signalled its appearance by forming part of the first and third prize crops, and also filled the fifth place. This variety has a high yielding capacity, and has given such good account of itself in variety trials on farmers' experiment plots and at the Department's experiment farm that it promises to supersede Waratah. It holds its grain better than Waratah and appears to be less liable to flag smut. It is, however, more susceptible to rust, and judging by its behaviour in this competition, there is evidence that it is even weaker in the straw than either Waratah or Nabawa. The only appearance of Waratah in this competition was as a third part of the champion crop, and in this case it was estimated to be the highest yielder in the whole competition.

The season was rather favourable to the production of good yields by late-maturing varieties, and they were in a position to receive more benefit from the September rains than the early maturers. Yandilla King, therefore, succeeded in winning two local competitions, and Turvey one competition. It is not considered advisable to sow large areas with late-maturing varieties in these dry districts, but they are sometimes useful for sowing during the first couple of weeks in April, provided the seed-bed is moist at this time.

Ford, which makes its appearance for the first time in this competition, promises to be a more suitable variety for this area, not only by reason of its rather earlier maturity, but also on account of its capacity for resisting rust and its moderate resistance to flag smut.

Seeding Operations.—The competing crops were sown during the period from early April to 18th May. In recent years the best results have been obtained from crops sown early, but there has been a tendency for some farmers to start sowing too early; for instance, reports were received that some farmers had commenced sowing wheat early in March. This is considered too early, for there is a danger of the soil drying out and the seed being destroyed by mould, or the young seedlings perishing owing to lack of moisture, thus rendering re-sowing necessary at additional expense. Even under favourable conditions, such early-sown crops are frequently infested with wild oats and other weeds, or they make rank growth unless checked by feeding back with sheep.

The rates of seeding ranged from 40 to 60 lb. per acre, the former rate being used with Yandilla King (a good stooling variety) sown early at Hillston. Generally speaking, 45 to 60 lb. per acre may be regarded as the most satisfactory limits for rates of seeding in these areas.

The quantity of superphosphate varied from 28 to 60 lb. per acre, the champion crop being manured with the lightest quantity. A notable feature is that no less than five of the eleven competing crops were sown without an application of fertiliser. No doubt the very low prices ruling for wheat, and the lack of finance, have been responsible in many cases for this neglect to apply fertiliser, but it is probable that some also have been actuated by the experience of the preceding season, when good yields

resulted in some districts from crops which did not receive an application of superphosphate. Even though the season was much more favourable than normally, still the results of experiments in these same districts show that crops fertilised at the rate of ½ cwt. superphosphate per acre returned, on the average, a 20 per cent. increased yield over unmanured crops. Even a 20 per cent. increase represents an increase in yield of 3 bushels per acre on a 15-bushel crop, and nearly 5 bushels on a 24-bushel crop, for an outlay of approximately 2s. 6d. per acre. It is generally in seasons of low rainfall that the best response to fertilisers is obtained, and a greater increase can be expected under the less favourable conditions of this season. Judging by the lack of density of unmanured crops on experiment plots in these districts, in comparison with those manured, the increase will probably be substantial. To continue to sow wheat without superphosphate is most uneconomic, and it would be preferable to apply a light quantity, say, ¼ cwt. per acre, than none at all, but if it can be afforded an application of ½ cwt. per acre is recommended for these districts.

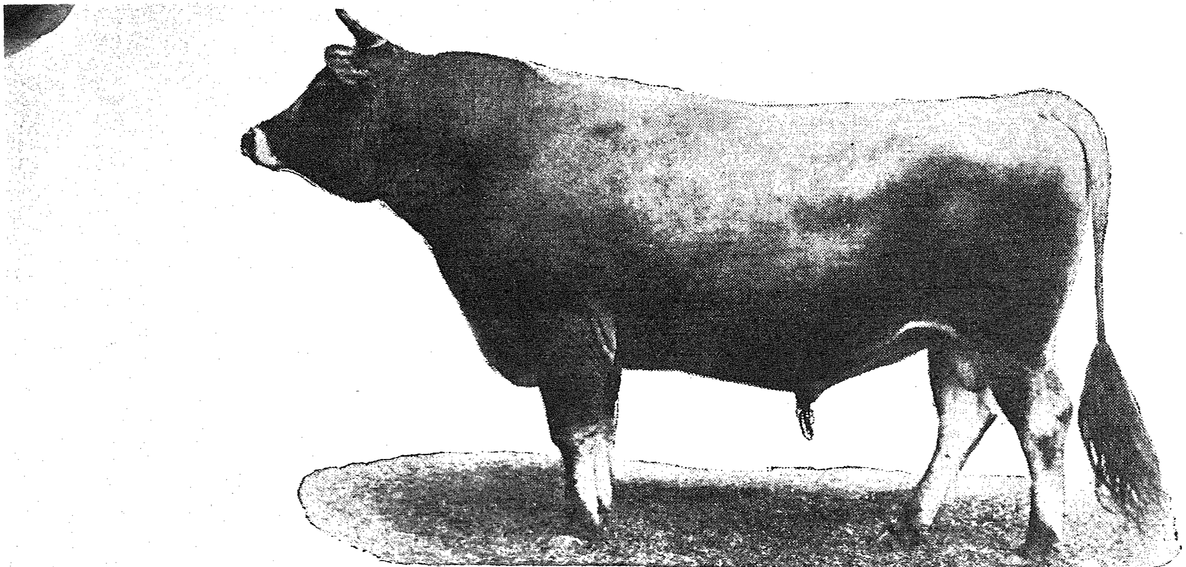
Diseases.—On the whole there was a satisfactory freedom from disease, due largely to the proportion of crops of Nabawa, which, as is the general rule, were practically free from flag smut. The crop of Ford was also free from flag smut, but it was present in crops of all other varieties, and one crop of Yandilla King was fairly badly infected.

Loose smut was more prevalent than formerly, particularly in Bobin and Turvey. Take-all was present in a couple of crops, and stem rust was also in evidence, but the crops were too far advanced in maturity to incur any damage; no doubt the cool, dry weather in October kept the fungus in check.

"The Trees of New South Wales."

"Increasing attention is being given to the value of trees, and there has arisen a need for a book which will supply in simple, non-technical language all that the average landholder needs to know about them. Hitherto most of the necessary information has been locked up in huge exhaustive botanical works, highly involved in their phraseology and largely given over to endless discussions as to the exact classification and means of identification of some particular species.

The inquirer's difficulties have now been simplified by the issue of *The Trees of New South Wales,* in which Mr. R. H. Anderson has sought to tabulate all the essential facts concerning the principal trees. The general botanical features, distribution and chief uses, not only of our native trees, but of many others which have proved of value in various districts, are indicated with a maximum of completeness but a minimum of scientific nomenclature. . . . . The book is published by the Department of Agriculture and at the modest price of 5s. deserves a place in the library of every progressive landholder."—Extracts from a review in *The Sydney Morning Herald.* [Postage 6d. extra.—Editor.]



FINVOY GOLDEN NOBLE (Imp. N.Z., Vol. 15).

Departmental herds include the following Stud Bulls :—

Guernsey : HOPEFUL OF WOLLONGBAR (499), Champion, R. A. Show, Sydney, 1928. *Ayrshire :* SCOTTISH PRIDE OF GOWRIE PARK (3797), First and Champion, R. A. Show, Sydney, 1927 ; First and Reserve Champion, R. A. Show, Sydney, 1928. *Milking Shorthorn :* MORNING STAR OF DARBALARA (Vol 8), Second, R. A. Show, Sydney, 1928. Morning Star is ex Melba 15th of Darbalara, World's champion cow of all breeds—32,522.5 lb. milk, 1,614.1 lb. butter fat in 365 days. *Jersey :* FINVOY GOLDEN NOBLE (imp. N.Z., Vol. 15):

The Department has for sale young bulls from tested dams of the following breeds :—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

Application should be made to—THE UNDER SECRETARY, Department of Agriculture, SYDNEY

Basal Glume Rot.

A Bacterial Disease of Wheat.

R. J. NOBLE, Ph.D., Biologist.

THE most serious diseases affecting wheat crops are caused by parasitic fungi. Several bacterial diseases of wheat are recorded elsewhere, but thus far only one, basal glume rot, has been recorded in New South Wales. This disease was collected for the first time in this State in a crop of Federation

Fig. 1.—Wheat head affected with Basal Glume Rot (slightly enlarged).

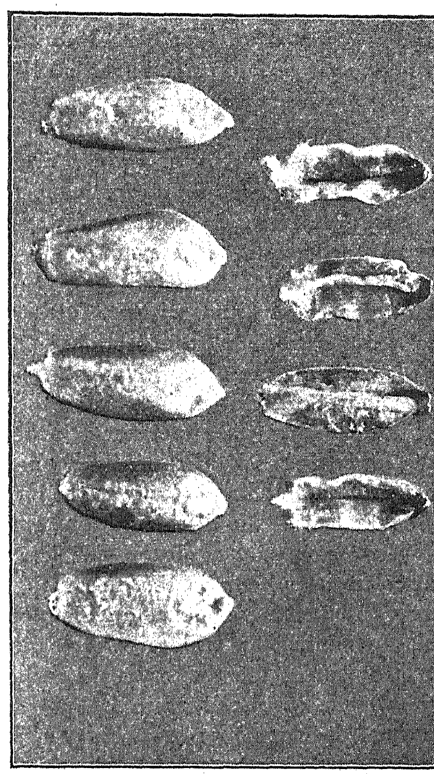


Fig. 2.—Normal and Diseased Grains from Wheat Head partially affected with Basal Glume Rot.

near Narromine in 1924; it has since been recorded from widely scattered sections of the wheat belt and has again been observed during the present season.

It is possible that the disease is more prevalent than appears to be the case, as the symptoms are not always readily recognised, but it is considered that it has not yet caused any serious reductions in yield in this country.

Basal glume rot was first described in the United States in 1920[1]. It is now to be found in practically all of the wheat-growing areas of that country, and it is also recorded from Canada. The disease rarely causes serious damage in the United States and usually does not result in losses in excess of 1 per cent. In 1929, however, basal glume rot was reported[2] to have been common in Kansas and rather severe in certain sections, especially in river bottoms and lodged spots. In 1930, a very heavy infection was reported[3] to have developed in crops in the same State. In many fields, 10 to 25 per cent. of the heads were infected, in some cases every spikelet was infected, and in one county 50 per cent. of damage was observed in individual crops. Although the disease was generally considered to be prevalent in the State, this was the first record of the development of the disease in epidemic form. The disease has also caused some damage in Canadian crops and is reported[4] to have caused appreciable losses in the three Prairie Provinces each year during the period 1920-24.

The disease is thus not as widespread in its occurrence as the more serious bacterial disease of wheat, black chaff, which is recorded in the United States, Canada, Russia, China, France and Belgium, and which, fortunately, has not been found in this country.

Basal glume rot is recorded only on wheat; it is not known to affect other cereals or grasses. The symptoms of the disease are most readily observed on the glumes or chaff (Fig. 1). Some of the spikelets may have a dull, brownish colour, and, without further examination, this may be attributed to frost action or to infections by the glume blotch fungus, *Septoria nodorum*. If the outer glume is removed, however, a much more marked discolouration will be observed on the inner side of the glume, commencing at the point of its attachment to the rachis and extending generally over the lower or basal third of the glume. The infected areas are brownish in colour, and on being held up to the light are observed to be semi-transparent. The borders of the discolourations may be dark-brown or black.

The inner glumes of the spikelet generally show a much more marked discolouration than is the case with the outer glumes, and, in fact, there may be but little evidence of infection at all in the outer glumes, although close examination will reveal the presence of a dark line at the point of attachment of the glumes to the rachis.

In some cases the grain is but slightly affected and may complete its normal development; in others the infection apparently occurs earlier and the grains may be severely shrivelled. Such grains show a well marked "black end" condition, the discolouration extending throughout the cells of the grain at the embryo or germ end (Fig. 2). All the grains of the head may be affected, but more frequently sound grains, slightly infected and severely infected grains may be found on the same head.

Laboratory examination has shown that bacteria are constantly associated with the discoloured areas on glumes and grain, and cultural study has indicated that the causal organism is *Bacterium atrofaciens* McCul., and is thus identical with the form originally described as the cause of the disease in the United States.

Studies conducted by McCulloch, *loc. cit.*, in America have shown that the leaves may also be affected. Shortly after inoculation, small water-soaked areas appear on the leaves, the spots later turn yellow, enlarge slightly and finally the infected tissues become dry and brown.

Practically nothing is known as to the conditions which favour infection or whether the causal organism is mainly carried over from season to season in infected seed or in the soil. It is most probable, however, that infections are to be expected when moist or humid conditions are experienced at the heading period. A good seed sample is not likely to contain much infected grain, the shrivelled grains being either blown out or collected with the chick wheat at harvesting. Seed treatment is reported to reduce the infection in the case of black chaff, and it is expected that the usual agricultural practices adopted under New South Wales conditions, viz., burning of the stubble, fallowing and seed treatment, will also be effective in minimising losses from this disease.

The photographs for this article were taken by Mr. P. R. Maguire.

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[1] McCulloch, L.—1920. Basal Glume Rot of Wheat. *Jour. Agr. Research* 18: 543-551.

[2] Johnston, C. O.—1929. Diseases of Wheat in Kansas. *U. S. Dept. Agr., Bur. Pl. Indus. Plant Dis. Reptr.*, 13: 86. (Mimeographed.)

[3] Melchers, L. E.—1930. Cereal Diseases in Kansas. *U. S. Dept. Agr., Bur. Pl. Indus. Plant Dis. Reptr*, 14: 145. (Mimeographed.)

[4] Drayton, F. L.—1926. A Summary of the Prevalence of Plant Diseases in the Dominion of Canada, 1920-24. Canada Dept. Agric., Div. Botany, Bull. 71 (N.S.), pp. 1-61, 1926. Abstracted in *Rev. Appl. Mycology*, 6: 272.

Infectious Diseases Reported in December.

The following outbreaks of the more important infectious diseases were reported during the month of December, 1932 :—

Anthrax	5
Blackleg	8
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	9
Swine fever	Nil.
Contagious pneumonia	3
Necrotic enteritis	Nil.

—Max Henry, Chief Veterinary Surgeon.

Treatment of seed wheat with bluestone solution for the prevention of bunt is still practised by some growers, but dusting with dry copper carbonate is the method now favoured by the Department. Use 2 oz. with each bushel of grain and treat in a suitable machine. Treated in this way seed is not liable to reinfection by bunt balls among the grains.

Cocksfoot (*Dactylis glomerata*).

The Importance of "Strain" When Purchasing Seed.

A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

The comparatively poor results produced by cocksfoot in many districts of the State under the extremely favourable conditions which prevailed during the spring of last year are sufficient justification for directing the attention of farmers to the question of "strain" in connection with this valuable grass.

Cocksfoot is perennial in habit, and is generally grown in association with perennial rye grass on the better quality soils. It has a wide range of adaptability, however, and can be grown under conditions unfavourable to perennial rye grass. Cocksfoot is persistent, palatable and nutritious, and is one of our most valuable pasture species. In coastal districts, and on the coastal plateaux, cocksfoot was sown many years ago, but was gradually ousted by paspalum; it reappears, however, when the paspalum pastures are renovated by ploughing or cultivating and top-dressing, thus affording evidence of its persistency and suitability to the conditions. In tableland districts cocksfoot must be considered one of the most useful and important species. Being cold and frost resistant, it provides grazing during the winter months, and in association with species such as perennial rye grass, *Phalaris tuberosa,* white clover, perennial red clover and subterranean clover, is a valuable component in pasture mixtures. For hill country, which is not intensively grazed, excellent results can be expected from this grass, whilst for intensively grazed pastures, good results will be obtained, provided the right strain is used.

Prejudice Due to Inferior Seed.

Unfortunately, many farmers are decidedly prejudiced against cocksfoot and are reluctant to include it in pasture mixtures when advised to do so. This prejudice is principally due to the behaviour and growth form of the plants produced by the average sample of commercial seed, and the fact that so much of this seed has been sold and sown is greatly to be deplored, affecting, as it has, the farmers' confidence in one of our most useful pasture species. In cocksfoot, as in perennial rye grass and other species, there are various strains, and, unfortunately, the greater bulk of the seed sown by our farmers appears to have been of inferior quality in this respect.

The best type of cocksfoot is that with fine shoots and leaves, freely produced from all portions of the crown. Under heavy grazing this type stands up well and does not die out in the centre. At the other extreme, in terms of pasture value, is the stemmy type with comparatively few broad shoots, which, under heavy grazing, take the form of lateral growths.

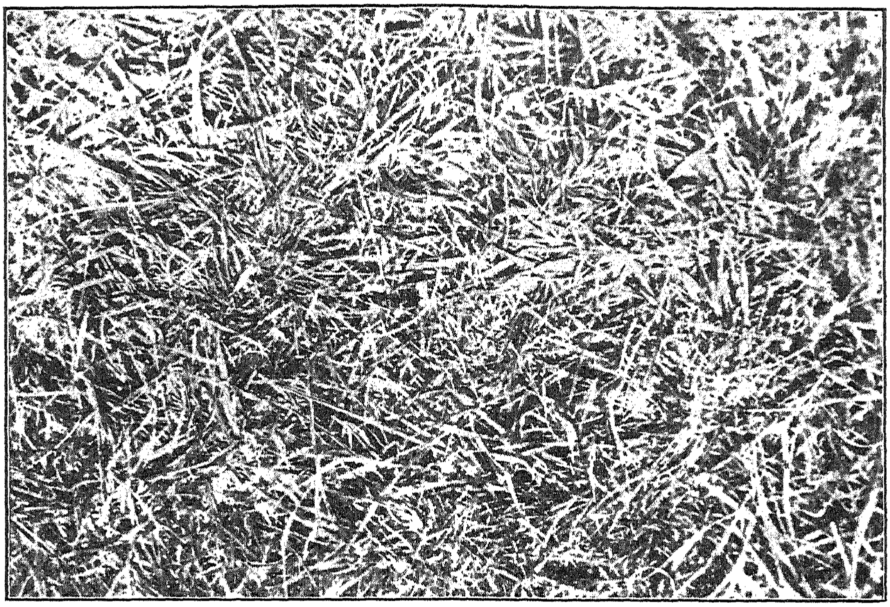

Fig. 1.—The Type of Pasture Produced by a Desirable Strain of Cocksfoot, such as New Zealand Government Certified Seed.

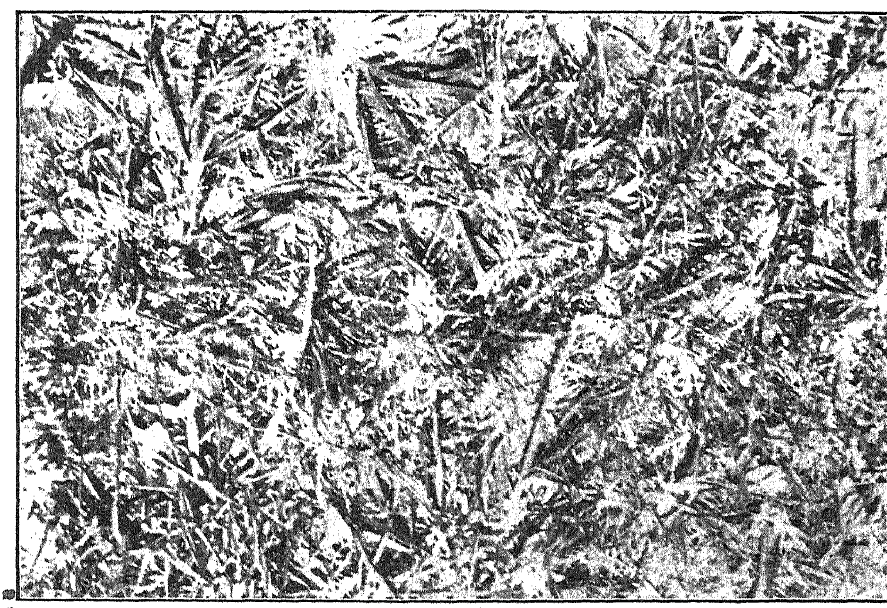

Fig. 2.—Type of Pasture Produced by a Poor Strain of Cocksfoot of European Origin. Note numerous plants with dead centres and coarse lateral shoots and leaves, also absence of topgrowth.

The leaves are few and broad, and in grazed paddocks are produced from the margins of the crowns only, the centres dying out and becoming unproductive. Farmers are only too conversant with this type.

The illustrations accompanying this article indicate the strain differences referred to. They represent two strains of cocksfoot grown in adjacent plots at Berry Experiment Farm under identical conditions of soil and treatment. Sown in July, 1931, the original source of seed, in one case, was the Plant Breeding Station, Aberystwyth, Wales, and in the other, commercial seed of European (presumably Danish) origin was used. The area has been treated as an ordinary grazing paddock, grazing being rotational. During the past winter, grazing by the dairy herd has been fairly heavy and the reactions of the two strains can be readily seen in the photographs.

Fig. 1 shows the fine leaves and shoots and the excellent ground cover or sward produced by a desirable strain of cocksfoot, there being a notable absence of plants with dead crowns.

Fig. 2 provides an interesting contrast. There is a poor ground cover and the majority of the plants have dead unproductive crowns and coarse, lateral shoots. Little top growth is apparent.

Some years ago the New Zealand Department of Agriculture recognised the superiority of the best local strains of cocksfoot compared to the commercial European seed, and, as a measure of protection to their farmers and to local seed growers, instituted regulations compelling importers of cocksfoot seed to stain a certain proportion of each consignment a red colour. The stained seed is then mixed with the bulk, thus making it possible to identify imported seed at a glance. Unfortunately, a considerable quantity of European seed imported into New Zealand ultimately finds its way to Australia, and farmers would be well advised to refuse delivery of cocksfoot seed showing these red seeds. An additional reason for avoiding the use of this seed is that the pastures produced will not be as long-lived as those produced by New Zealand seed harvested from old-established pastures.

When purchasing cocksfoot seed, farmers should stipulate New Zealand Government certified seed, as this is the best available commercial seed, and will produce long-lived pastures of the type shown in Fig. 1.

Can You Identify the Trees on Your Farm?

"Farmers and other rural workers who are interested in our native trees should obtain a copy of the book recently issued by the Department of Agriculture—*The Trees of New South Wales*, by R. H. Anderson, Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, Sydney University.

"It is teeming with most useful information and illustrations, and is presented in easily understandable form. A key by which any particular specimen may be determined is provided, together with a glossary of the names and a map showing the various forestry divisions of the State."—Review in *The Daily Telegraph*, Sydney.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Baringa	Manager, Experiment Farm, Temora.
Baroota Wonder ...	Manager, Experiment Farm, Temora.
Bobin	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Condobolin. E. S. Hazeldine, "Bunda Farm," Merriwagga. H. J. Harvey, "Kindalin," Dubbo. D. W. Edis, "Prestonville," Ariah Park. A. L. Harnett, Quandialla. W. G. Law, "Thistledown," Gilgandra.
Dundee	W. G. Law, "Thistledown," Gilgandra.
Duri	Manager, Experiment Farm, Condobolin.
Ford	H. J. Harvey, "Kindalin," Dubbo. W. R. Farrall, "Langside," Urana.
Free Gallipoli	Manager, Experiment Farm, Temora.
Geeralying	H. J. Harvey, "Kindalin," Dubbo.
Gluyas Early	Manager, Experiment Farm, Temora.
Gullen	W. G. Law, "Thistledown," Gilgandra. Manager, Experiment Farm, Temora.
Nabawa	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Condobolin. E. S. Hazeldine, "Bunda Farm," Merriwagga. Mark Sharman, "Mabruk," Erigolia. H. J. Harvey, "Kindalin," Dubbo. David Bolte, "Lincluden," West Wyalong. W. G. Law, "Thistledown," Gilgandra.
Pusa No. 111	Mark Sharman, "Mabruk," Erigolia.
Pusa No. 163	Mark Sharman, "Mabruk," Erigolia.
Riverina	W. G. Law, "Thistledown," Gilgandra.
Sepoy	W. G. Law, "Thistledown," Gilgandra. Manager, Experiment Farm, Temora.
Wandilla	W. G. Law, "Thistledown," Gilgandra.
Waratah	Manager, Experiment Farm, Temora. H. J. Harvey, "Kindalin," Dubbo.

Wheat—continued.

Yandilla King	Manager, Experiment Farm, Temora. David Bolte, "Lincluden," West Wyalong. A. L. Harnett, Quandialla.
Oats—	
Algerian	Manager, Experiment Farm, Bathurst. Manager, Experiment Farm, Temora.
Belar	Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Temora.
Gidgee	Manager, Experiment Farm, Temora.
Guyra	Manager, Experiment Farm, Bathurst.
Mulga	Manager, Experiment Farm, Temora.
White Tartarian ...	Manager, Experiment Farm, Bathurst.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Rams Made Available on Terms to Small Graziers.

THE conditions to be observed by small graziers (those owning approximately 2,000 breeding ewes) who wish to purchase rams on terms through the Department of Agriculture, under the scheme whereby £50,000 was made available for this purpose by the Government, are briefly as follows:—

(1) The price of rams must not exceed £3 3s. per head, exclusive of freight, spelling and watering charges, etc., if any. The limit of advance to any one applicant will be £40, plus freight, etc.

(2) Repayment will be by two approximately equal instalments. The first instalment (one-half the advance, plus interest to date on the advance) will be payable from the proceeds of the 1934 wool clip. The balance of the advance and interest on such balance will be collected from the 1935 wool proceeds. The applicant will be called upon to give preferential and irrevocable orders (to which the holder of any mortgage over the applicant's sheep must consent) authorising the wool buyer or broker to make such payments to the Minister. Promissory notes payable on demand will be required as collateral security.

Provided the undertakings embodied in the application form are carried out, the applicant will not be expected to make any payment either for rams, freight, etc., or interest) until his 1934 season's wool is sold, nor will the promissory notes be presented for payment.

(3) Rams will be purchased from registered stud breeders only. The applicant must nominate three breeders, any one of whom the Minister, on the advice of the Sheep and Wool Expert of the Department of Agriculture, may authorise to supply.

(4) In nominating breeders, the applicant should take into consideration rail freight and spelling charges. Local station-masters can give estimates of these costs. Where possible, it will be advisable to obtain rams from breeders in or near the applicant's district. A saving in freight may be effected by neighbouring applicants arranging for group applications so that full trucks may be despatched. The rams for each applicant can be marked for identification.

Sugar-cane on the Clarence.

RESULTS OF THE COMPETITIONS, 1932.

L. S. HARRISON, Special Agricultural Instructor.

THE competitions completed this year on the Clarence were in two groups —one-year and two-year cane. In the one-year group there were six entries and in the other twelve. They were representative of the cane areas of the Clarence River, and provided an excellent field for cultural treatment examination. It is again stressed that the details of preparation and cultivation are worth close attention, particularly if considered in conjunction with those of previous years. It was very unfortunate that such a very severe frost should have seriously interfered with the cane area. It was something quite outside the grower's control and caused in some cases serious damage to the crops.

A Crop of Sugar-cane Six Months Old.

.Green leguminous crops greatly benefit the following crop of cane, as they are a valuable means of improvement and maintenance of soil fertility. They have a direct nitrogenous value, as well as adding humus, which enriches the soil, makes plant food available and improves the texture and the ability of the soil to absorb and retain moisture. Cowpeas are preferable to field peas, as seasonal conditions are more suitable and a longer time is allowed for the thorough decomposition of the vegetable matter. These crops lose the greater part of their nitrogenous value if

allowed to ripen and dry off before being ploughed in. Maize is frequently used as a crop before cane, and this, although a sound practice to a limited extent, since soil improvement is effected through ploughing in the stalks, and as the crop gives a commercial return, has not a soil improvement value as great as the turning in of a green crop. When maize stalks are ploughed in late, or just before planting, it frequently occurs, in dry springs, that insufficient moisture is available to break the stalks down entirely, causing a possibility of air spaces in the soil and a drying out of moisture, which cannot be spared at that juncture. Growers must give particular consideration as to whether it pays them to grow maize between cane crops, or to concentrate on a legume, such as cowpeas.

The Two-year Competition.

A. Cameron.—This land had been under cultivation approximately forty years. Trash and cowpeas were ploughed in after the last cane crop, then maize and cowpeas were grown and ploughed in, followed by field peas, which failed before the first ploughing occurred in August, after which the land was harrowed twice, disc harrowed and re-ploughed. Planting took place at the end of October by a machine in 3-inch drills with a 3-inch cover, rows being 4½ feet apart and sets being dropped on the square. After planting, it was ploughed away, scuffled four times and chipped.

A. J. McDonald.—This land had been under cultivation about sixty years. Maize and cowpeas were planted following the previous crop of cane, but were flooded out; after that wheat and field peas were planted. Ploughing took place in April, after which it was disc harrowed both ways, then again in June; harrowed, rolled and re-ploughed; harrowed, rolled and re-ploughed; harrowed, rolled and disced, and finally harrowed and rolled. Planting took place at the end of September in plough drills 8 inches deep, with a 4-inch cover, with a double drop 4 feet on the square. After planting the land was cultivated or scuffled twelve time and chipped.

D. A. Cameron.—This land had been under cultivation for fifty years. Trash was ploughed in after previous crop of cane and cowpeas were planted. First ploughing was given in July, after which it was disc harrowed twice, re-ploughed, disc harrowed, harrowed and rolled. Planting with a machine took place in August in drills 6 inches deep, giving a 6-inch cover. The rows were 4½ feet apart with a double drop on the square. After planting, it was ploughed away, harrowed, chipped and scuffled eight times.

J. Commerford.—This land had been under cultivation approximately sixty years, and the previous crop to this was maize, no cane having been planted for five years. First ploughing was given in August, after which the land was disc harrowed, harrowed and rolled twice; re-ploughed, harrowed and rolled. Planting took place in October with a machine, in rows 4½ feet apart, sets being dropped 2 feet apart in an 8-inch drill with an 8-inch cover. After planting it was ploughed away and chipped off, scuffled twice, ploughed away, middled, scuffled twice and chipped.

RESULTS of Clarence River 2-year-old Competition, 1932.

Competitors.	Variety.	Cultivation. (Max. 20 points.)	Evenness and Lack of Patchiness. (Max. 20 points.)	Stooling. (Max. 10 points.)	Freedom from Disease. (Max. 15 points.)	Freedom from Lodging. (Max. 5 points.)	Points for Commercial Value of Crop.	Estimated Tonnage per acre.	P.O.C.S.	Total Points.
								tons.		
A. Cameron	Oramboo	17½	15½	7½	15	3	18	55	15·6	76½
A. J. McDonald ...	NG16 ...	18½	18	8½	15	5	11	45	13·4	76
D. A. Cameron ...	NG16 ...	18½	17	8	15	5	12	50	13·1	75½
J. Commerford ...	Malabar ..	17	16	8	13½	4½	16	65	13·2	75
A. McPhee	Badila ...	16½	16½	9	14½	4½	13	55	13·1	74
T. Eggins	Badila ...	17	16	8	14½	4½	13	55	12·6	73
K. Bathgate ...	Nanemo ..	18½	16½	9	14½	3	11	45	13·3	72½
J. Kenny	Malabar...	17½	17	8	13	4	13	60	12·0	72½
Est. Mrs. Green ...	NG16 ...	18	18	8	13½	5	8	45	10·7	70½
A. Stewart	NG16 ...	19	16½	9	10½	4	11	55	11·7	70
H. Watson	NG16 ...	15	14½	8	15	4½	13	50	13·4	70
C. Clark	Withdrawn	...	...	...	...	...	...	...	...	...

The One-year Cane Competition.

The general comments in connection with the two-year competition can, in most instances, be applied with equal force to this contest.

A. J. McDonald.—This crop was grown on old land. After the previous cane crop the trash was ploughed in and a good crop of maize and cowpeas was grown. The cowpeas were ploughed in, in early May, and the maize was ploughed in, in June, after being disc harrowed. These were grown in alternate rows, thus permitting the cultural treatment at different times. The land was then harrowed and rolled, re-ploughed, harrowed, re-ploughed and harrowed twice. Planting took place early in September by hand, in 10-inch drills, which were given a 4-inch cover. Rows were 3 feet 9 inches double dropped on the square. The land was then scuffled three times, after rain it was ploughed away, raked off, scuffled three times, lightly hilled, middled, scuffled three times and raked back.

E. J. Chaseling.—This was new land, maize having been planted prior to potatoes. It was ploughed at the end of June, after which the land was harrowed, rolled, re-ploughed, harrowed and rolled. Planting by hand took place at the end of August in 4-inch drills, and given a 2-inch cover. Rows were 4½ feet apart with a single drop on the run. After planting, the land was rolled, ploughed away, scuffled twice, ploughed away, scuffled, harrowed and scuffled twice.

J. Skinner.—This land had been under cultivation approximately fifty years, and for the last fifteen years has been growing cane. Maize and cowpeas were grown in 1929 and beans in 1930. Potatoes were planted in early July and harvested in the end of October. The first ploughing took place in March, after which the land was re-ploughed and rolled. With the

beans 1½ cwt. mixed fertiliser to the acre was applied. Planting took place at the end of August, sets being dropped in 5-inch drills with a 5-inch cover. Rows were 4 feet 3 inches apart, single sets being dropped every 18 inches. After planting, the land was rolled, harrowed, ploughed away, scuffled off, ploughed away, scuffled and middled, raked off, ploughed away, raked off, middled and scuffled three times. When the cane was planted, 3 cwt. mixed fertiliser to the acre was applied, then in April another 3 cwt. was dropped between the rows.

E. Stanmore.—This land had been under cultivation for many years, and prior to this crop was planted half to field peas and half to maize, mostly utilised for feed purposes. First ploughing took place in August, after which the land was harrowed, rolled, re-ploughed, harrowed, rolled and re-ploughed. Planting by hand took place early in September in 9-inch drills with a 5-inch cover. Rows were 4½ feet apart, and single sets were dropped 1 foot apart. After planting the land was harrowed twice, scuffled twice, ploughed away and scuffled three times. The quality of this crop was most likely reduced by the severity of the frosts.

RESULTS of Clarence River 1-year-old Competition, 1932.

Farmer.	Variety.	Cultivation. (Max. 20 points.)	Evenness and Lack of Patchiness. (Max. 20 points.)	Stooling. (Max. 10 points.)	Freedom from Disease. (Max. 15 points.)	Freedom from Lodging. (Max. 5 points.)	Points for Commercial Value of Crop.	Estimated Tonnage per acre.	P.O.C.S.	Total Points.
								tons.		
A. J. McDonald ...	Q. 813	19	18½	9	15	3½	12	40	11·7	77
E. Chaseling	Q. 813	18	17½	8½	15	4	10	35	11·5	73
J. Skinner	Q. 813	18	16	7½	14½	5	9	25	13·3	70
E. Stanmore	Q 813	17½	16½	8	15	5	2	20	7·7	64
J. Hart and A. O. Watson.	Withdrawn.	...	...	...	...	...	...	...	...	...

NOTE.—For the purpose of affording a better balance, the commercial value of the crop in the one-year competition was calculated on the basis of three points instead of two.

The Colonial Sugar Refining Co. at Harwood Island afforded all possible assistance in connection with this competition.

PRAISE FOR THE DEPARTMENT'S EDUCATIONAL WORK.

COMMENTING recently on the steady increase in the average yield of wheat per acre in New South Wales, notwithstanding that the wheat area was being pushed out into the drier districts, Prof. R. D. Watt, Dean of the Faculty of Agriculture of Sydney University, gave as one of the main factors making such an achievement possible the educational work of the Department of Agriculture coupled with the crop-growing competitions, which brought the benefits of the improved methods to the notice of the farming community.

Mineral Deficiency in the Southern Coastal Belt of New South Wales.

A Preliminary Survey.

[Continued from page 18.]

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In the previous section of this article, published last month, the authors presented the reasons for and the scope of the survey, as well as a tabulation and discussion of general and analytical data from fifty-six soils in the area.

The present section comprises a discussion of the analytical data from "affected" and "non-affected" soils, and of the calcium, phosphorus and protein content of the pastures on certain of these soils.

In these discussions reference is often made to the tabular matter which appeared on pages 14 to 17 in the January issue.

A Discussion of the Analytical Data from "Affected" and "Non-affected" Soils.

THE data from selected soils (Nos. 4, 6, 10, 15, 16, 17, 21, 22 and 23—Congo and Wolumula chiefly—in the table given on pages to in issue) from farms which are reported as badly affected, that is soils on which grazing stock unless fed bran, phosphatic licks or similar supplements in addition to the natural pasture develop definite signs of osteomalacia, average as follows:—pH, 5.45; organic matter and combined water, 5.58 per cent.; available, P_2O_5, .0015 per cent.; available CaO, .088 per cent.

The data obtained for an equal number of soils (Nos. 1, 11, 29, 50, 55, 56, 67, 68 and 69) which are reported as from non-affected farms, that is soils on which grazing stock although fed continuously upon natural pasture have not, up to the present, exhibited signs of osteomalacia, average as follows:—pH, 6.08; organic matter and combined water, 11.70 per cent.; available P_2O_5, .0056 per cent.; available CaO, .229 per cent.

The data was also summarised for forty-three soils (Nos. 2, 3, 4, 6, 8, 9, 10, 12-28, 30-48) from farms on which the stock have to a greater or less extent exhibited those symptoms associated both here and elsewhere with mineral deficiency. Such cattle are at various times and places known as "bone-chewers," "cripples," "stiffs," "coasties," and so on, and in general they lack thriftiness and bloom and tend to be small framed and fine boned. Although the farms from which these samples were taken are affected, there are on some of them small areas of better class country from which some of the soils were obtained. These forty-three soils average as follows:—pH, 5.8; organic matter and combined water, 7.23 per cent.; available P_2O_5, .0024 per cent.; available CaO, .127 per cent.

In considering the analyses of this third group, the following points are of some interest:—

Soils 2, 3 and 4 are from the same property, one on which the incidence of osteomalacia was so intense that dairying was abandoned and sheep grazed instead.

Soils 8 and 9 are from the same property, but from different paddocks.

Soil 12 is exceptional as coming from a reputed affected holding.

Soils 17 and 18 are from the same farm but from different sections. The soil 18 section is clinically and locally regarded as better country, and receives wash from the hills above. Cattle running on the hills do not suffer from osteomalacia.

Soil 21 is from a farm with an unusual history of mortalities, but in which the typical osteomalacia syndrome is not observed. Cattle have to be removed from the area after running on it for two or three months.

Soils 22 and 23 present an interesting contrast, as they are from neighbouring areas. Symptoms are much more marked in cattle grazing over soil 23. Soil 22 comes from a section on which the timber has only recently been rung.

Soils 28 and 30 are from the same farm as soil 29 ("non-affected"), but from a different paddock.

Soils 32 and 33 are from the same holding. The section of the farm from which soil 33 was taken is recognised as better country, and on it the milking cows are grazed, whilst the dry stock are placed in the section from which sample 32 was taken. The deficiency is not intense on this farm.

Soils 34, 35 and 36 are from the same locality. Cattle on these sections exhibit osteophagia only in dry times.

Soil 38 is of interest, as it is particularly noted that the cattle devour phosphatic lick ravenously in dry times.

Soil 41 is from a farm from which cattle must be removed after a few weeks in dry times.

Soil 42 is from a farm on which it is recorded that bone-chewing is common when rabbits overrun the country.

When the analytical data for the soils in the foregoing group are examined in detail it will be seen that the "affected" and "non-affected" condition does not in every instance appear directly related to percentage amount of available phosphoric acid present in the soil; *i.e.*, exceptions occur, but in quite a number of these it will be noted that there are pronounced differences in reaction, physical condition of the soil and content of organic matter, which should doubtless be taken into consideration in interpreting the figure obtained for available phosphoric acid. When averages for the groups, rather than the figures obtained for individual soils, are considered and compared, the differences in the percentage amounts of available phosphoric acid as well as of other constituents in the soils would appear quite appreciable and on the whole significant.

The average percentage amount of available phosphoric acid present in the nine soils from "affected" areas is as low as the percentage amount of this constituent which has been found in South African soils where aphosphorosis is reported to occur, while the average percentage amounts of both available phosphoric acid and lime which has been found in the forty-three soils clinically affected to a greater or less extent are as low as the percentage amounts of these constituents which are reported[7] to occur in an affected area in Kenya Colony.

From the data so far collected, it would appear, therefore, that the "affected" condition of the soil is associated with, if not actually dependent upon, the presence in the soil of a relatively low percentage amount of citrate-soluble phosphoric acid co-incident with a marked acid reaction and a relatively low percentage amount of organic matter.

Other factors may, of course, be involved, for the soil, it must be remembered, is a complex and delicately balanced system. Secondary chemical reactions may readily occur within it owing to acidity and these as well as physical and biological processes may play their part in determining the degree to which a soil is affected in any particular case.

Calcium, Phosphorus and Protein Content of Pastures.

Twenty-eight pastures from an equal number of the soils previously referred to were chemically examined in connection with the work. The pastures were sampled at approximately the same period of the year, and observations were made and recorded of the chief species of plants they contained (see tables on pages 14 to 17, in the January issue). The percentage amounts of ash, calcium, phosperous and protein they contained were determined, and the results expressed on a water-free basis are given in the following table, corresponding numbers (with the addition of the letter A or B) being used for pastures from particular soils:—

MINERAL and Protein Content of Natural Pastures.

Lab. No.	Percentages in Dry Matter of Pastures.				
	Total Ash.	Nitrogen.	CaO.	P_2O_5.	Crude Protein.
6A...	8·31	1·703	·484	·358	10·64
7A...	9·59	1·39	·581	·186	8·68
12B	7·42	1·488	·816	·285	9·3
14A	8·85	1·092	·573	·173	6·82
23A	......	2·383	1·245	·604	14·89
26A	......	2·011	1·416	·896	12·56
27A	......	1·563	1·097	·320	9·76
29A	......	1·523	·865	·390	9·51
30A	......	1·301	·712	·210	8·13
31A	8·97	1·64	·827	·343	10·25
32A	10·69	1·25	·958	·253	7·81
33A	9·05	1·358	·743	·362	8·48
34A	8·42	1·041	·316	·234	6·50
35A	8·04	1·265	·517	·315	7·90
36A	5·84	1·383	·430	·235	8·64
37A	8·20	1·018	·306	·243	6·36

MINERAL and Protein Content of Natural Pastures—*continued.*

Lab. No.	Percentages in Dry Matter of Pastures.				
	Total Ash.	Nitrogen.	CaO.	P_2O_5.	Crude Protein.
38A	7·22	1·353	·492	·342	8·45
39A	8·06	1·16	·439	·197	7·25
40A	8·93	1·161	·278	·240	7·25
42A	7·36	1·387	·651	·363	8·66
43A	8·18	1·431	·743	·390	8·94
44A	9·24	1·071	·460	·274	6·69
46A	8·51	1·363	·673	·403	8·51
47A	8·51	1·055	·604	·225	6·59
48A	8·81	1·056	·316	·170	6·60
50A	9·78	1·12	·647	·367	7·00
55A	9·16	2·479	·470	·555	15·49

The grasses and other plants for which colloquial names are given in the table in the previous issue have been identified by the Agrostologist to the Department of Agriculture as follows:—

Love grass ...	*Eragrostis leptostachya.*	Bergalia	*Carex longifolia.*
Paspalum ...	*Paspalum dilatatum.*	Dandelion (Cat's Ear)	*Hypochaeris radicata.*
Couch	*Cynodon dactylon.*	Cocksfoot... ...	*Dactylis glomerata.*
Kangaroo ...	*Themeda australis.*	Rye grass ...	*Lolium* sp.
Trefoil	*Medicago* spp.		

There are also present in the pastures—

Rib grass	*Plantago lanceolata.*	Rat's Tail Fescue	*Festuca bromoides.*
Blady grass ...	*Imperata arundinacea.*		

A Discussion of the Pasture Data.

From a study of the pasture analysis table and of the general table given in the previous issue, it will be seen that twenty-one of the pastures examined were obtained from soils (Nos. 6, 12, 14, 27, 30-44, 47 and 48) on farms on which the cattle exhibited clinical evidence of deficiency. The analytical data for the pastures on these twenty-one soils show the following average percentages:—CaO, .575; P_2O_5, 272; crude protein, 8.05 per cent.

Three pastures were obtained from soils reported "non-affected" and three from "affected" soils which had received manurial treatment. The data for these six soils is shown below:—

Pasture No.	Percentages in Dry Matter of Pastures.		
	CaO.	P_2O_5.	Crude Protein.
	Non-affected.		
29	·865	·390	9·51
50	·647	·367	7·00
55	·470	·555	15·49
	Manured.		
23	1·245	·604	14·89
26	1·416	·896	12·56
46	·673	·403	8·51

The average amount of phosphoric acid in these six pastures is .535 per cent. This percentage is relatively high, and, along with the average amount of protein (11.33 per cent.) they were found to contain, may broadly indicate a difference in general composition between these pastures and those on which the stock exhibited clinical evidence of deficiency. Nevertheless the total number of such pastures examined is far too small for any inferences to be drawn from the results.

The remaining pasture, 7A, was not included in the above table owing to the abnormal character of the soil upon which it was grown. The soil, as mentioned previously, was found to be saline, and this circumstance makes it possible that it might serve to some extent as a "natural lick."

The figures obtained for the pastures indicate a general correlation between the percentage amounts of phosphoric acid and protein. The percentage amount of phosphoric acid which was found in the pastures reported "affected" ranged from .170 per cent. in pasture 48A to .39 per cent. in pasture 43A, the average content of this constituent for the twenty-one pastures examined being .272 per cent.

The amounts of lime present showed considerable variations, and ranged from .278 per cent. in the case of No. 40A to 1.09 per cent. in pasture 27.

The ratio of lime to phosphoric acid is seen to be comparatively high in most of the pastures examined. This may be due to dry weather conditions which prevailed over a considerable area of the Eden Pastures Protection District prior to the date at which samples were collected; for there is some evidence to show that during periods of drought the intake of lime by a growing pasture falls relatively less than does that of phosphoric acid. The greater prevalence of bonechewing among grazing stock which has been observed during spells of dry weather may conceivably be due as much to this disturbance of "balance" between lime and phosphoric acid in the animals' feed as to actual low percentage amounts of phosphoric acid. In this connection, it is interesting to note that Meigs, Blatherwick and Cary[8] as the result of metabolism experiments with dairy cattle consider that phosphorus absorption from the intestinal tract was reduced by the presence of calcium, while Turner[9] and others have found that better assimilation of phosphorus took place when the ratio of calcium to phosphorus in a ration was 1.25 : 1 than when such ratio was 2.5 : 1. At any rate the possibility that a relative richness of calcium in an animal's feed may intensify the effects of phosphorus deficiency is one that should not be overlooked, and may indeed be quite an important factor in the problem.

(*To be continued.*)

REFERENCES.

[7] Economic Advisory Council.—Committee on the Mineral Content of the Natural Pastures; 6th Report.

[8] Meigs, Blatherwick and Cary.—*Jour. Biol. Chem.*; XL; 469.

[9] Turner *et al.*—*Jour. Agr. Res.*; XXXV; 625.

Apparently Healthy Potato Plants may be Carriers of Virus Infection.

A recent issue of the *New Zealand Journal of Agriculture*, in describing the objectives and work of the Lincoln (N.Z.) Pure Seed Station, gives space to some interesting observations made in regard to the elimination of virus infection from potato crops. The report runs:—

The problem of raising virus-free seed has developed complications as the work has advanced. Plants affected with virus disease usually exhibit visible symptoms on the foliage, associated with a serious diminution in yield. Aphids transmit certain of these diseases from plant to plant in the field, and infection is maintained from year to year primarily through the use of infected seed. Avoidance of these diseases offers the only solution, and the first step in selection work has been to search for plants that appear free from infection. The produce of these is then multiplied under conditions which will reduce to a minimum the possibility of infection from outside sources.

Leaf-roll is the most common virus disease in New Zealand, and the loss from this cause alone is very serious. Fortunately, avoidance has proved relatively simple. Mild mosaic has also offered very little difficulty. Despite all precautions, however, by roguing, and by planting nothing but the produce of what appear to be disease-free plants, a few severely virus-infected plants continue to appear. Certain peculiarities characterise the appearance of these plants. They appear as severely diseased individuals in a crop which is otherwise healthy and vigorous; they arise suddenly from no apparent source of infection; the range is more or less restricted, and the disease is not found commonly in commercial crops; and, finally, only certain varieties are affected.

Research workers in potato virus diseases have proved that certain varieties are carriers of infection, but do not themselves exhibit any symptoms. This being the case, two apparently healthy varieties growing near one another may be a source of infection to each other, and one or both may exhibit virus disease the following season. Such infection causes, in many cases, a very severe form of virus, which may even result in the death of the plant.

This discovery necessitated a complete revision of the methods being adopted at the station, and seemed to explain the sudden appearance of virus disease in certain of the lines. Up to this time the practice had been to select large tubers from plants which appeared healthy, to cut each tuber into four parts and plant these as a tuber unit. Every tuber unit showing signs of disease was at once removed and the remainder harvested. The produce was multiplied in short rows, and from there to larger blocks, until sufficient material was available. Dealing with a number of varieties, and growing the tuber units together, later the short rows together, and so on, step by step, it will be realised that ideal conditions were afforded for transmission of virus from one variety to another. With fuller knowledge of the problems relating to the carriers of these diseases, it is now almost certain that the planting system was at fault and had been the cause of virus disease manifesting itself from no apparent source.

The first precaution taken was to grow all tuber units in small isolation plots in a crop of oats. This resulted in such marked improvement as to warrant an attempt to isolate as far as possible one variety from another through each stage of multiplication. The system now adopted is to plant the tuber units and small increase plots of any variety within the larger increase blocks of that variety, situating these plots preferably on the windward side.

This ensures that the increase plots are removed as far as possible from any other variety. Moreover, each series of plots is separated from the others by strips of oats or blue lupins, and where the increase block adjoins that of another variety a wide strip of some buffer crop is grown. This is not regarded as completely effective in checking the spread of the disease, but it does in practice afford a check to the migration of those insects which are in a great measure responsible for the distribution of virus.

Flies and Nematodes Associated in Flower Bud Galls of Spotted Gum.

W. L. MORGAN, B.Sc.Agr., Assistant Entomologist.

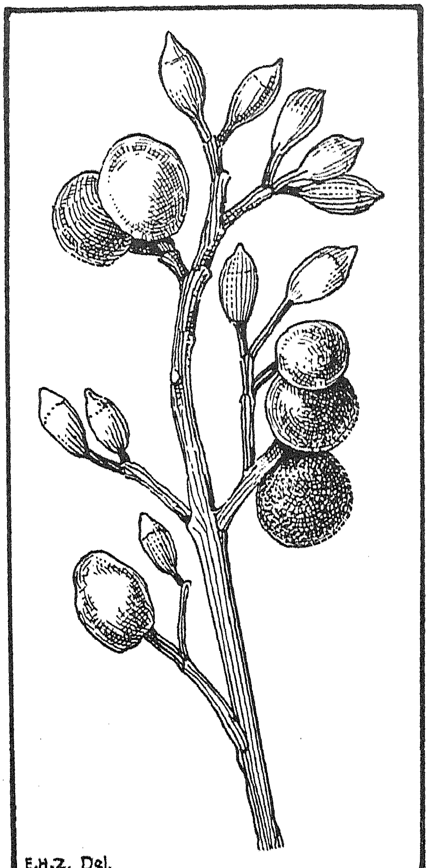
LATE in 1929 the Commissioner for Forestry wrote to the Department of Agriculture, pointing out that reduction of seeding in spotted gum (*Eucalyptus maculata*) was occurring in the State forests of the south coast districts. The matter was referred to Mr. W. B. Gurney, Entomologist of the Department, who arranged for the writer to visit the districts concerned and make preliminary studies to locate the cause and in particular to investigate a galling of the flower buds which seemed to be associated with the reduction in seeding. The inaccessibility of the galls on the trees made it difficult to observe the cause and extent of the galling, but it was found, by counts made on 9th October, 1930, on branches from a number of trees that about 10 per cent. of the bud clusters exhibited at least one or more galls. It was noticed that galling of buds seemed to have caused several of the uninfested buds to fall. This was suggested by the fact that the average number of buds and galls in affected clusters was 4.1 and in unaffected clusters 9.5. Only about 2.6 per cent. of all the buds examined were galled. Galling, therefore, did not seem to constitute a menace to an adequate development of seed, but it must be remembered that during dry periods there is usually a heavy fall of buds from eucalypts, and it is conceivable that at such times the additional loss of buds due to the galling might result in a very light setting of seed. Examination of material collected from other districts along the coast revealed that in at least two of the areas, namely, Wyong and Casino, a similar galling occurs in *E. maculata* flower buds.

The galls are rounded, up to 1 inch in diameter, and are honeycombed with cavities, each cavity containing a fly larva. The young gall, containing immature larvae, is soft and fleshy, but becomes hard and woody after the fly larvae commence to pupate. From the galls three new species of gall-forming flies—*Fergusonina eucalypti* Mall., *F. Gurneyi* Mall., and *F. biseta* Mall.—were developed in the laboratory. A technical description of these flies appears in the Proceedings of the Linnean Society.*

F. gurneyi (Fig. 2) is slightly smaller than *F. eucalypti* (Fig. 1) and *F. biseta*, which are about one-fifth of an inch in length. *F. eucalypti* and *F. biseta* are yellow, but the former species may be distinguished by the presence dorsally on the abdomen of a dark-brown patch which covers nearly the whole of the second, third, and fourth segments. *F. gurneyi*

* "Notes on Australian Diptera." J. R. Malloch; *Proceedings of the Linnean Society of New South Wales*," Sept., 1932, Vol. LVII, parts 3–4, pages 213–17.

is yellow ventrally, but is dark-grey on the dorsal surface of the thorax and abdomen. The legs of all three species are yellow and the wings are hyaline.



Flower Buds of ***E. maculata.***
Some of the buds have been formed into rounded galls by flies of the genus *Fergusonina.*

From specimens of the galls collected at frequent intervals from Bateman's Bay and forwarded to Sydney for laboratory examination it was deduced that the flies have an annual life-cycle, the egg and larval stages together occupying nine to ten months. The larvae pupate in the spring, the adults emerging from the galls towards the end of spring and during early summer. Buds six months old are infested, and those eighteen months old are also probably attacked but to a less extent.

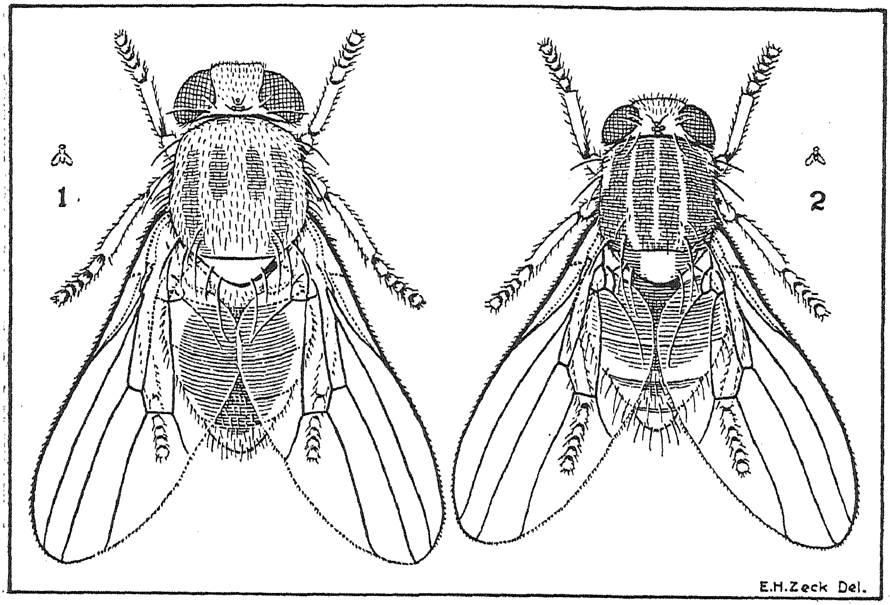
F. eucalyphi appears to be mainly responsible for the galling, as this was the only species developed from the majority of the galls. *F. gurneyi*, which was developed from small galls about ¼ inch in diameter, was more numerous than *F. biseta*, of which two specimens only were obtained. Whether two or even the three species are able to develop in the same gall was not determined.

Several species of hymenopterous insects were developed from the galls. The habits of these—whether parasitic or inquiline—were not investigated, but as in several instances a living wasp larva and the remains of a fly larva were found in gall cavities, some degree of parasitism of the fly larvae would seem to occur. The larva of the curculionid beetle (*Haplonyx albisparsus* Lea), which breeds in the developing galls, also destroys a number of the fly larvae in its feeding.

The most striking feature in the complex of organisms occurring in the galls of *E. maculata* was the discovery by the writer in 1930 of a number of nematodes associated with the fly larvae in the gall cavities. Whether the fly larva is able to develop independently of the nematodes and cause the galling has yet to be determined; in every instance in the large number

of gall cavities examined this association of fly larva and nematodes occurred. The nematodes were not present inside the tissues of the gall, but were free-living in the fly larval cavity.

The development of the nematodes and the determination as to whether their association with the fly larva is a symbiotic or parasitic one are interesting subjects for further investigation.



Flies Developed from *E. maculata* Bud Galls.

1. *Fergusonina eucalypti*, Malloch.

Thorax mainly yellow, with faint longitudinal brown stripes, inner ones very short. Dark brown patch on upper surface of abdomen. *F. biseta*, Malloch, resembles *F. eucalypti* in size, but abdomen is entirely yellow.

2. *F. gurneyi*, Malloch.

Four broad longitudinal dark stripes on thorax. Scutellum with dark patch on either side. Basal abdominal segments darkened.

Thanks are due to Mr. Clulee, District Forester at Moruya, and Mr. Yeo, the Forester at Bateman's Bay, for their assistance in collecting and forwarding galled material for examination; also to Mr. J. R. Malloch, Washington, U.S.A., who identified the flies.

It should be understood that mere cutting, scaffolding, and hanging the tobacco leaves in an open shed can never be expected to give good uniform results, writes the Tobacco Expert of the Department of Agriculture, in a leaflet on tobacco growing, which is distributed free to all interested. Leaf so treated, he continues, is just dried out, not cured. This State is subjected to rapid changes of climatic conditions, and tobacco which is left solely to the chances of the weather invariably suffers.

Tobacco Notes for February.

C. J. TREGENNA, Tobacco Expert.

Tobacco-curing Barns.

WITH the approach of the tobacco harvesting season the question of curing the leaf will already be exercising the minds of growers. Any makeshift building will not answer the purpose, particularly if the grower intends to flue-cure his leaf. The wise grower, therefore, will need to make his plans immediately for the erection of an efficient barn if there is not already one on the property. Working-size plans of the flue-curing barn illustrated opposite can be had on loan from the Department; also plan of the furnace used for heating the barn.

Flue-curing barns must be draught-proof and so finished that heat and moisture cannot escape, and they must be erected of materials that will prevent the interior from being influenced to any great extent by outside temperatures. If iron is used double walls will be necessary in order to obtain the necessary degree of insulation. A brick structure, on the other hand, is expensive. Wood, pisé, fibro, and similar materials are some of the most suitable materials for tobacco-curing barns.

In order that a grower might have some idea of the size of barn he requires, it is mentioned that the inside dimensions of a barn suitable to cure the crop from 6 or 7 acres would be 16 feet by 16 feet and 17 feet high, with a spacing of 3 feet 6 inches vertically between the tiers on which the sticks of tobacco are hung when harvested on the stalk, and 2 feet when the leaves have been "primed."

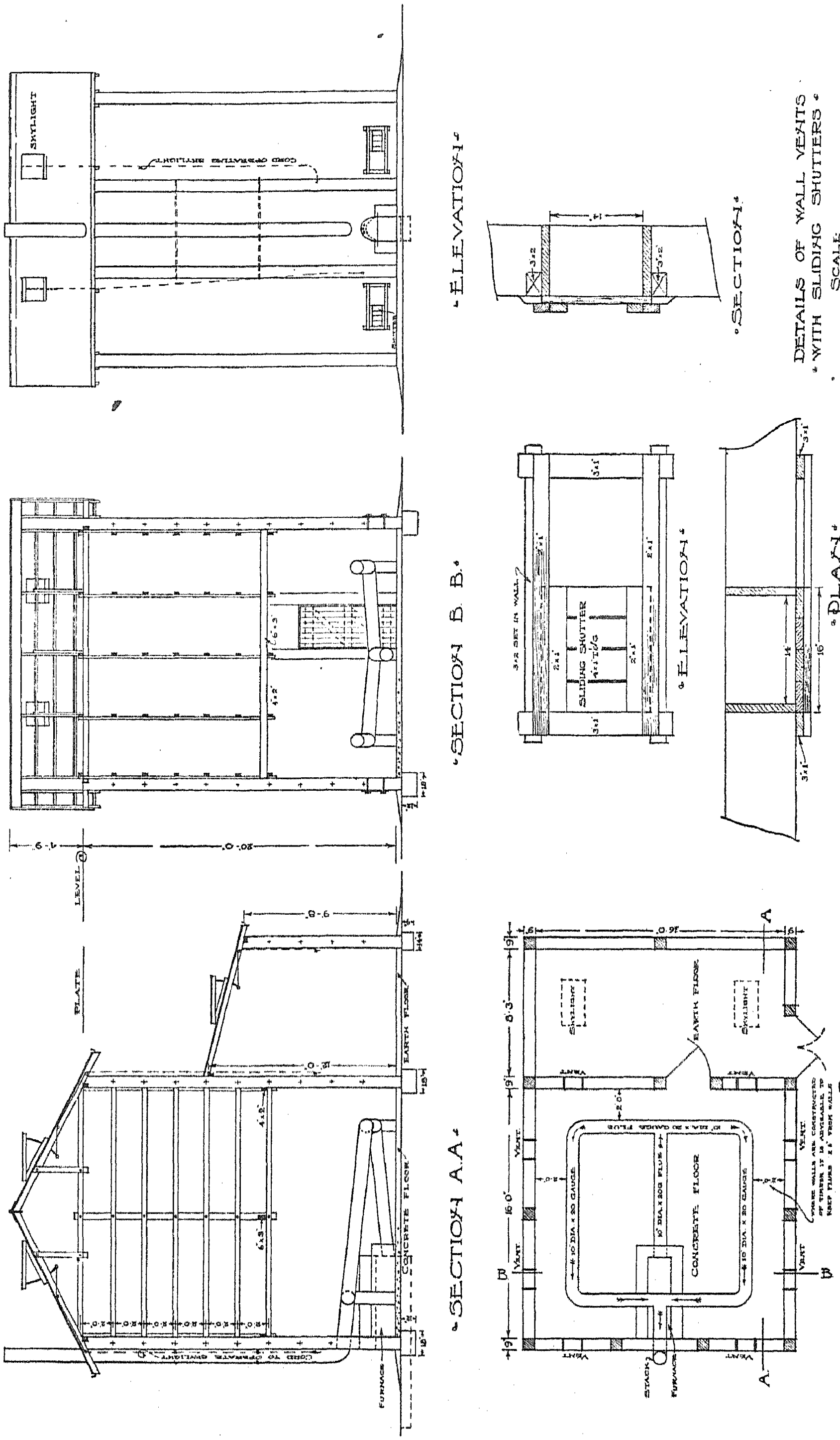
Flue-curing Described.

Whilst on the subject of curing-barns, a description of what is involved in the actual curing of the leaf will help to emphasise the importance of an efficient barn.

At the outset it is pointed out that whilst much good leaf is often spoilt by improper curing, it is not possible to make good tobacco out of poor leaf even by employing the best known curing methods. The first essential to success, therefore, is leaf harvested at the correct stage of maturity.

There are three stages in curing. They may be stated as follows:—(1) Yellowing, (2) fixing, (3) killing. No fixed formula can be given, but if the following is taken as a basis the grower will, after curing a few barns, be able to modify or vary the process in some respects to give him the desired results.

As soon as the barn is full, close the building right up, start the fire going, and bring the temperature up to 90 degrees Fahr. Keep it at this point for eighteen to thirty-six hours, according to the condition of the leaf, limiting the time to the shorter period in the case of leaf that is quite



Plan of Flue-curing Tobacco Barn.

ripe, and allowing the full period where the leaf is not so well matured. If the leaf is not yellowing as it should, place sacks on the floor and soak them with water to produce a moist heat; or, better still, if a boiler is handy introduce steam. When the leaves have assumed a nice yellowish colour raise the temperature to 100 degrees, at the rate of 5 degrees each two hours, and keep at this figure for some six hours. Then raise the temperature to 105 degrees and give a little ventilation top and bottom, opening the ventilators a few inches. In these directions it is presumed that the curing-room is one that has been erected in accordance with the plans supplied by the Department of Agriculture. In such a building both temperature and ventilation could be controlled so as to produce the results desired.

Having obtained the temperature of 105 degrees with the limited ventilation mentioned, the conditions should be maintained for three or four hours. Then increase the temperature to 110 degrees, and also increase the ventilation to about one-half of the capacity of the ventilators, and hold at that for three hours. Do not raise the temperature above 110 degrees until the tips of the leaves have dried, however. Next, again raise the temperature to 115 degrees for six hours, giving *full* ventilation, and then again advance to 120 degrees for six hours with full ventilation. The most critical time is between 110 degrees and 120 degrees. If the heat is too fast the leaf will splotch or blister, and if too slow it will sponge. When the sweat can be observed on the leaf, and it will not go off at once, the temperature must be increased rapidly by 10 degrees, and all available ventilation given; but if ventilation is given as directed there is little fear of sponging.

After remaining at 120 degrees for six hours, leave the ventilation at full, and increase the temperature by 5 degrees every two hours to 135 degrees; beyond this do not further increase the temperature until the blade of the leaf has dried out completely. Then exhaust all moisture by raising the temperature every hour by 5 degrees to 180 degrees, and gradually decrease the ventilation until only a very little is left at the top. Keep at the latter temperature until the stems and stalks have completely dried out. Ventilation plays a *most important part* in successful flue-curing during the stage from 105 to 140 degrees, and growers should pay particular attention to this matter. The whole process will take five or six days.

Extinguish the fire as soon as the tobacco is cured, and open the doors and ventilators to cool it off for twenty-four hours. If the weather be very dry, the moisture content of the barn may be increased with the aid of steam, or by means of water thrown on sacks on the barn floor. When the tobacco is in a condition to handle without the leaves breaking, it should be taken down on the sticks and bulked until the grower is ready to grade and bale for market as opportunity occurs.

Australian Tobacco Investigation Urges Caution.

"Tobacco is an exacting crop from such diverse points of view as climate, suitable soil, manures, cultivation, harvesting, curing and marketing, and a good product is possible only by meeting the requirements of the plant

in all respects," writes Mr. B. T. Dickson, Director of Australian Tobacco Investigation, in a prefatory note to the recently-issued bulletin, "Tobacco Production in Australia." Mr. Dickson goes on to say that it is essential, for the satisfactory establishment of the tobacco-growing industry, that indiscriminate planting in unsuitable areas should be avoided at all costs. He also points out that individual growers can help materially by critically examining the results of the past season, with a view to determininig whether the quality of their product actually justifies further production.

Agricultural Bureau Winter Fodder Championship.

As in previous years the branches of the Agricultural Bureau of New South Wales in the North Coast district conducted winter fodder competitions and a district championship. A detailed report has been published in the January issue of *Bureau Record*, the official organ of the Agricultural Bureau movement, and only the championship crops are referred to in the following table of awards.

Awards in Agricultural Bureau Winter Fodder Championship.

Branch.	Competitor.	Crop.	Points Awarded. Suitability of Crop for Fodder.	Leafiness and Succulence.	General Appearance.	Stage of Maturity.	Freedom from Disease.	Yield Points. (2 per ton.)	Total.
		Maximum ...	(30)	(15)	(15)	(15)	(10)	...	...
Fosterton	Bosworth Bros. ...	Sunrise, Gresley, peas and vetches.	26	14	13	14	8	42	117
Kendall	C. L. Lee	Sunrise Gresley, peas and vetches.	22	13	14	13	8	44	114
Dumaresque Islands	J. P. Mooney ...	Sunrise, Gresley and peas..	21	12	13	12	8	48	114
Temagog – Turner's Flat.	J. W. Booth ...	Mulga, Gresley and peas...	20	12	14	13	9	40	108
Krambach	Mrs. Martin ...	Buddah, Canberra, peas and vetches.	22	12	14	11	8	40	10
Bandon Grove ...	E. Kingston ...	Sunrise, Gresley and peas	21	12	15	12	8	34	102
Austral Eden ...	C. G. Sanders ...	Sunrise, Gresley and peas	19	13	14	13	8	34	101

In his report Mr. J. M. Pitt, Senior Agricultural Instructor, pointed out that the season was not a favourable one by any means—except that cultural operations and sowings were made under fairly good conditions. The winter months were particularly dry and conditions severe—heavy frosts and snow on the higher lands in June made the month one of the worst on record. Undoubtedly the good preparatory cultural operations adopted by the growers of the better plots stood to the crops until useful rains came in late July and August.

The champion plot, entered by Messrs. Bosworth Bros., of Fosterton, was a well-balanced mixture sown at the rate of 40 lb. Sunrise oats, 10 lb. Gresley wheat, 10 lb. Lima field peas, and 5 lb. Woolly-podded vetches per half acre, with superphosphate at 1 cwt. per half acre and a top-dressing of sulphate of ammonia at ¼ cwt. per half acre.

A Note on Tung Oil.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

THE tung oil tree (*Aleurites Fordii*) is a native of central and western China, which country, until recent years, was the only one in the world growing the tree commercially. Steps have been taken to test the possibilities of the tung oil tree in Australia, and the New South Wales Department of Agriculture is experimenting with it and has distributed a considerable number of seeds to private growers with the idea of testing the suitability of the tree to various parts of the Commonwealth.

There are no large commercial groves of tung oil trees yet in full production and selling commercial oil in New South Wales, therefore no definite figures regarding yields, prices, and expectations are quoted.

Caution Urged.

It is probable that when the districts most suited to commercial production have been definitely proved appreciable quantities of tung oil may be produced here, and it is possible that an export trade in the oil could be established. At present, however, prospective growers are advised that while the tree is worth testing in the better rainfall districts along the coast and tablelands the industry is still in the experimental stages of development, and consequently the planting out at the present time of large commercial areas is not advised where there is any doubt as to the suitability of the climate or soil.

Climatic and Soil Requirements.

An annual rainfall of not less than 28 or 30 inches seems to be required, heavier rainfall, of course, being preferable. A hot summer and a fairly cold winter seem to suit *Aleurites Fordii*. In China, where it thrives best, although snow is often present in winter there is generally only about 4 degrees of frost. The trees do not appear to do well where more than 12 or 13 degrees of frost occurs. On the other hand, if the winter is not sufficiently cold to give the tree a definite resting period and cause it to shed its leaves the yield is not likely to be satisfactory.

The tree is very adaptable so far as soils are concerned, growing well on most classes of soil. It, however, prefers a slightly acid soil and does not thrive where the surface soils contain much lime. A deep soil of a sandy or light nature well supplied with organic matter is very suitable, but the tree grows well on any well-drained fertile soil.

Uses of Tung Oil.

Tung oil is an important constituent of waterproof varnishes and paint liquids and is imported by the United States, Great Britain, Australia and other countries from China. The oil is also used as an ingredient for dressing leather and for varnishing furniture and floors. These are the main uses, there being many other minor purposes for which tung oil is used.

Ophthalmia in Sheep.

H. G. BELSCHNER, B.V.Sc., District Veterinary Officer (West).

OPHTHALMIA may be defined as an inflammatory affection of the eyes and adjacent parts. It is quite a common disease among sheep, and is generally termed "pink-eye" by stock-owners. The disease is liable to attack any of the domesticated animals, but next to sheep, cattle are more commonly affected, among which, as in sheep, it frequently breaks out as an epizootic at certain seasons of the year, quite a number in the flock or herd being then affected.

Cause.

Until recently outbreaks of ophthalmia have been attributed to the entrance of foreign bodies into the eyes, *e.g.*, dust (particularly during hot, windy weather), sand, hay, grass seeds, etc., also prolonged exposure to sun glare or cold winds. Experiments carried out at the Veterinary Research Station, Glenfield, however, have shown that the disease is quite definitely of an infectious nature, though the actual infective agent has not as yet been discovered. Many different organisms have been isolated from cases of the disease, but attempts to reproduce the disease with these organisms have all failed. The possibility of the disease being due to a virus or ultra-visible organism was also investigated, but such was not detected.

That the disease is infectious, however, has been proved by the fact that a drop of the secretion (tears) from an infected sheep, upon being placed in the eye of a healthy sheep, reproduces the disease in two days. And, furthermore, it has been shown that healthy sheep placed in contact with affected sheep readily become affected if the pasturage is long, the healthy sheep, grazing over the same ground as the affected animals, coming in contact with heads of grass which have been soiled by the secretion from the eyes of affected animals.

Immunity.

It has been found at Glenfield that following recovery, an eye is immune against re-infection. This immunity does not, however, extend to the opposite eye unless that also was affected with the disease.

Symptoms.

Outbreaks of ophthalmia usually occur during the hot summer months. In the early stages of the disease there is a watery discharge from the eyes, an intense inflammation of the mucous membrane of the eyelids as exhibited by the lining membrane being bright red in colour, accompanied also by swelling and partial closing of the eyelids, and an early opacity or film forming over the eyeball. The watery discharge soon changes to one that is thick and whitish or yellowish in colour, often containing pus sometimes streaked with blood, which collects inside the eyelids and along their edges, and in the inner corner of the eye, gluing the eyelids and eyelashes

together, and making it impossible for the animal to separate the eyelids without assistance. The nictitating membrane or haw of the eye projects more than usual, and there is a marked dislike to light.

The formation of the whitish film over the front of the eyeball may partially blind the animal for a time, and occasionally suppurative keratitis or ulcer of the cornea occurs. This ulcer may eventually eat through the front of the eyeball, causing permanent loss of sight in the affected eye. The attack of the disease is frequently accompanied by fever and constitutional disturbance. The affected animal goes off its feed and separates from the others, and rumination is suspended.

One or both eyes may be affected. In sheep, the disease usually occurs in both eyes. Unless prompt treatment is carried out, total or partial blindness may result. Less severe cases may recover without treatment, but often the eyeball is left somewhat whitened.

Treatment.

When the disease breaks out amongst sheep, they should be mustered without delay, as successful treatment depends largely on taking the trouble in hand before it has advanced too far. Where only a small percentage of the sheep are affected, these should be drafted off and kept separate from the rest of the flock until they have recovered, and the healthy sheep should, if possible, be transferred to a fresh paddock. When the disease is fairly general in the flock, the bad cases only need be drafted out and kept in a hospital paddock convenient for further treatment. While the sheep are mustered they should *all* be treated with one or other of the following lotions, both of which have been found to be very effective:—

(1)	Sulphate of Zinc	1 part.
	Boiled Water	40 parts.
	Equal to one dessertspoonful of Sulphate of Zinc in half a pint of water.	
(2)	Iodine	3 grains.
	Potassium Iodide	6 grains.
	Boiled water	2 ounces.

Two or three applications of either of these lotions at intervals of a few days are usually sufficient to check the disease in the early stages. Where, however, the disease is well advanced, such as in the sheep that have been placed in the hospital paddock, daily or twice daily applications of the lotion will be necessary until recovery occurs. In obstinate cases, it has been found that good results are frequently obtained by changing the lotion used to the other recommended.

Before administering the lotion, the eyes should be freed from overgrown wool, grass seeds, etc. For removing grass seeds, a small pair of surgical dressing forceps, which can be purchased quite cheaply, will be found most convenient. Wooden forceps may also be used, and can be home made, but care should be taken to see that the points are nicely rounded off so that they will not injure the eye. The sheep should then be held with the head on one side, the eye directed upwards, and several drops of the lotion instilled into the eye by means of an eye-dropper or piece of clean cloth saturated in the lotion, or with a feather which has been cleaned in boiling

water. In doing this, the eyelids should be drawn away from the eyeball, and care taken to see that the lotion flows under the lids and reaches all parts of the eye.

When bad cases have been drafted out, these should receive more constant treatment. Gummed eyelids should be separated by bathing with warm water, and when the eyes have been cleaned, the lotion should be applied. Recovery will be expedited and the fly nuisance lessened if these severe cases can be kept in a dark shed.

In the case of valuable or stud animals, the above treatment may be augmented by the use of the following ointment:—

Yellow Oxide of Mercury Ointment	1 part.
Vaseline	9 parts.

This ointment should be applied just inside the upper or lower eyelid after the early soreness and redness of the eye has disappeared. The treatment should be continued until recovery has taken place.

Good nursing, and the provision of green succulent feed, together with the administration of an active purgative drench, such as 4 to 6 ounces of Epsom or Glauber's salts for a sheep, at the onset of the disease will assist in hastening recovery.

The treatment of the disease in other animals follows the same general principles as outlined above.

Swede Turnips—Twelve to the Hundredweight.

Grown by Mr. M. Richards, of Lochinvar, the twelve Purple Top swede turnips shown in the accompanying block weighed 112 lb. The largest of the twelve just turned the scales at 13 lb., while the four largest totalled in weight 39 lb. Since this photograph was taken, Mr. Richards harvested one swede weighing 15 lb.

Outsize in Swede Turnips.

Grass Seed Certification Scheme Initiated.

Realising the advantages that grass seed certification schemes have bestowed on other countries, it will be gratifying to farmers in this State to learn that Mr. J. N. Whittet, Agrostologist, has initiated a scheme for the certification of Toowoomba Canary grass (*Phalaris tuberosa*).

The work has been commenced in the Northern Tablelands division of the State, principally in the Glen Innes, Stonehenge, and Guyra districts. The inspection of areas submitted by farmers and graziers, as well as the paddock-sealing of the bags of seed, will be undertaken by Mr. A. L. Clothier, Assistant Agrostologist, whose headquarters are at the New England Experiment Farm, Glen Innes. Paddocks of *Phalaris tuberosa* that prove to be true to type and have been established for five or more years will be certified as "Mother" seed areas, and those which have been established for less than five years will be classified as "Permanent Pasture" seed areas.

The object of the scheme is to ensure that purchasers obtain seed that is true to type, and in the case of this particular grass it will prevent the substitution of the useless Annual Canary grass (*Phalaris minor*) seed for the valuable perennial type, *Phalaris tuberosa*.

When further testing of the regional strains of New South Wales Perennial Rye grass has been carried out by the Department, certification of this species will also be undertaken. It is also intended at a later date to extend the scheme of seed certification to cover other species of grasses and also certain clovers.

Intending producers and vendors of certified agricultural seeds are reminded that such seeds must comply with the provisions of the New South Wales Agricultural Seeds Act and regulations in regard to standards of purity and germination.

Additional District Sheep and Wool Instructors Appointed.

The small flockowners of the State, who have received such valuable assistance in the improvement of their flocks from the present small staff of district sheep and wool instructors, will welcome the news that two additional appointments have been made. The new appointees are Messrs. L. H. Beveridge, H.D.A., with headquarters at Dubbo; and C. J. Daley, with headquarters at Wagga.

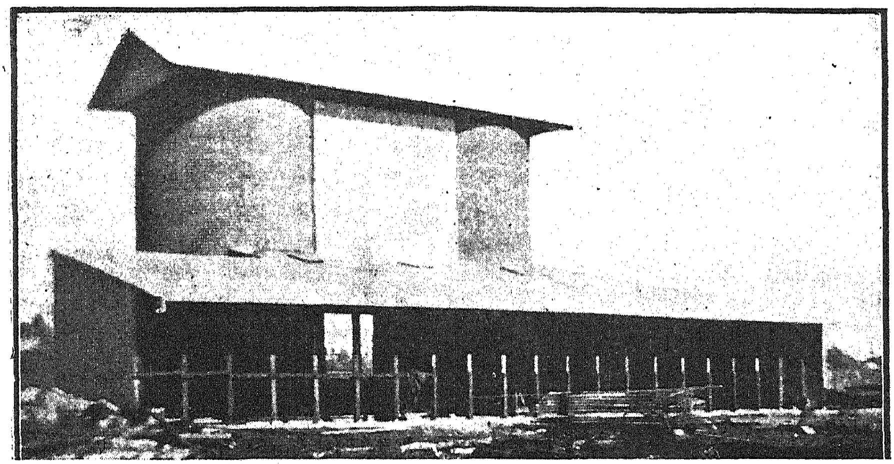
Meat Consumption Per Head in Various Countries.

Although figures are not available for many countries, there are some striking contrasts in the amount of meat consumed by the inhabitants of the various countries. Australia and New Zealand consume nearly 250 lb. of meat per head each year, mainly beef and mutton, while for the United Kingdom, the United States and Canada, the quantity is rather less than 150 lb. per head, of which pork accounts for over 80 lb. and beef for 60 lb in Canada and the United States, but beef for 70 lb., pork for little over 40 lb. and mutton for 30 lb. in the United Kingdom. Germany eats more pork than beef, France more beef than pork, and neither any considerable quantity of mutton, their aggregate consumption of all meats being approximately 110 and 90 lb. per head.

Dairying Notes.

Silage is Relished by Dairy Cows.

In the coastal districts maize is the most popular crop for silage-making, and while silage is relished by dairy stock and is capable of maintaining them in good condition without the admixture of other feeds, much better results are obtained by using it together with such foods as bran, pollard, oilcake, or lucerne hay. Many dairymen have obtained excellent results from feeding maize or sorghum silage with lucerne hay at the rate of 3 lb. silage and 1 lb. lucerne hay per day for each 100 lb. body weight of the cow.



Twin Concrete Silos and Feeding Stalls.

Concentrates may be added to the ration, a mixture being preferable to a single concentrate. Cracked or crushed grain, bran, pollard, linseed meal, and copra cake are suitable for this purpose. A concentrate mixture may be fed according to the yield of the cow and the amount of pasture available. For the summer months the following will be found a good mixture:—

	lb.
Maize silage	25
Green maize	25
Lucerne hay	10
Bran	2
Linseed meal	2

Oaten and wheaten chaff can also be fed in conjunction with silage, but more concentrates should be used.

The only care to be taken in feeding silage is not to overfeed bulls. Excess feeding of silage to bulls tends to develop a "pot" belly, and thus affects their potency. The maximum amount that a bull should receive is 15 lb. a day.

A Good Substitute for Pasturage.

Farmers frequently ask if silage is equal in feeding value to green grass, and it must be said at once that it is not equal to an ordinary mixed pasturage, though it is a very good substitute. Mixed pasture, on a fairly good soil, is almost ideal feed, as it is made up of many kinds of true grasses, legumes, and other herbs. It is therefore fairly well balanced in regard to protein and carbohydrates, and is also extremely palatable; which is an important feature. Pastures made up entirely of one kind of grass, such as those of the coast, where paspalum has possession, are not entirely satisfactory owing to the lack of variety.

As a rule, silage is made from one crop only—generally either maize, sorghum, or winter cereals, and as these are weak in protein the silage is somewhat deficient in that very important food constituent. For this reason it has been found economical to add the concentrates mentioned.

Plans and specifications of all recommended types of silos are obtainable from the Department of Agriculture.

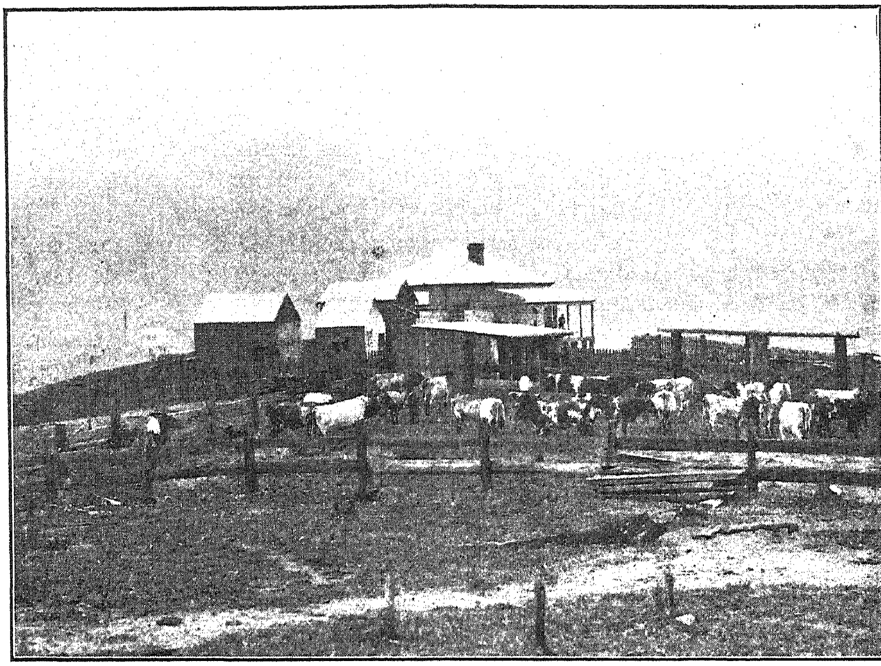
Tree Planting on the Dairy Farm.

DAIRYING being mainly carried on in the fertile coastal area, the dairy farm is generally accepted as being set in picturesque surroundings. The bare ugliness of some dairying properties, however, is sometimes astounding. In the early days of settlement, when the process of clearing was essential for the progress of settlement, many landholders came to regard tree life as an enemy and something to be destroyed, an idea which still persists in the minds of many. It should, however, be generally recognised that the prosperity, fertility and comfort of any district and country is intimately associated with the existence and preservation of at least some forest cover.

Apart from the question of appearance, trees serve many other useful purposes, the chief of which are dealt with in "Tree Planting on the Farm" (Farmers' Bulletin No. 167), by R. H. Anderson. The price is 1s. 1d. posted, and copies can be obtained from the Department of Agriculture. This booklet, as its title implies, describes in detail the method of raising and planting trees, as well as giving a list of the most suitable trees for various purposes in different districts.

"The Trees of New South Wales," by R. H. Anderson, price 5s. 6d. posted, a companion volume to the first-mentioned booklet, has just been published, and it has received very favourable notice from reviewers. Although not of particular interest to dairy-farmers, it should prove of

general interest, as apart from describing the native and introduced trees of this State, the utility of the various species from the farmer's and the pastoralist's points of view is emphasised.



The Bare Ugliness of a Treeless Farm.

Handle the Cows Quietly.

MILKING cows should not be handled roughly at any time. More especially must they be gently handled when they are being driven in to milk and while they are in the milking yards and bails. Rough treatment lowers the quality of the milk by heating and irritating the cows, and for the same reason it reduces the quantity of milk yielded. It is thus in the dairyman's interest to provide for his cows carefully and to handle them gently.

Unless the yards and bails are laid out on the best plans a lot of inconvenience is caused both the milker and the cows. A very complete set of excellent plans of dairy-farm buildings is given in *The Dairy Manual,* price 1s. 2d. posted, from the Department.

Advances to Dairy Farmers for Improvements, etc.

MANY applications have been received for advances under the scheme whereby £150,000 was made available by the Unemployment Relief Council to the Dairy Promotion Board for the purpose of enabling those already dairying, also settlers taking up land with the object of dairy-farming, to

purchase stock and provide necessary improvements and plant. Advances are made on the following terms and conditions:—

Application in the prescribed form must be lodged with the manager of a registered dairy produce factory operating in the district, to which the whole of the applicant's dairy produce is or will be delivered. Only suppliers or intending suppliers to such a factory will be eligible to apply.

The amount that may be advanced to any one applicant shall not exceed £400, and the applicant must provide from his own resources an amount equal to one-third of the estimated total cost of the stock, plant, and improvements required. From the amount to be provided by the applicant he will be required to pay for all necessary labour on the works.

If an advance is granted the settler must execute in any form that may be required, an assignment of portion of the proceeds of sales of cream and/or milk to the extent that may be determined.

The applicant must undertake to repay to the Crown all moneys advanced under the loan, together with interest at the rate of 3 per cent. per annum. The term of any loan for purchase of stock and/or plant shall not exceed ten years. The term of any loan for other purposes shall not exceed fifteen years, and such term shall commence as from the date of payment of the first instalment of the advance. From the date of the first advance and during the first two years of the term, interest only shall be payable. For the remaining years of the term interest and redemption shall be payable by monthly instalments.

Each settler must execute in favour of the Minister for Agriculture security for the advance by way of a charge over his holding, and/or in any other form required.

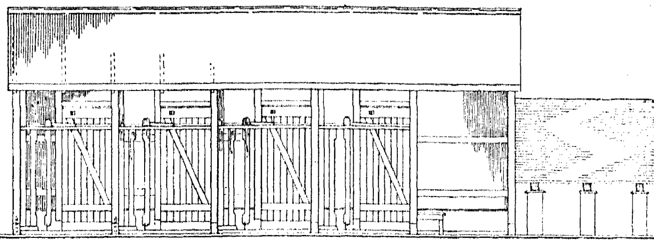
Advances will not be made for the payment of wages for existing employees, nor for sustenance. The amount approved to be advanced to the settler will be allocated for the purchase of materials for necessary improvements in the nature of fencing, erection of dwelling, bails, etc., and to provide essential stock and plant.

Settlers must furnish information as required regarding the progress of work for which advances provide, and allow any representative of the local dairy produce factory or the Department of Agriculture to inspect their property at any time.

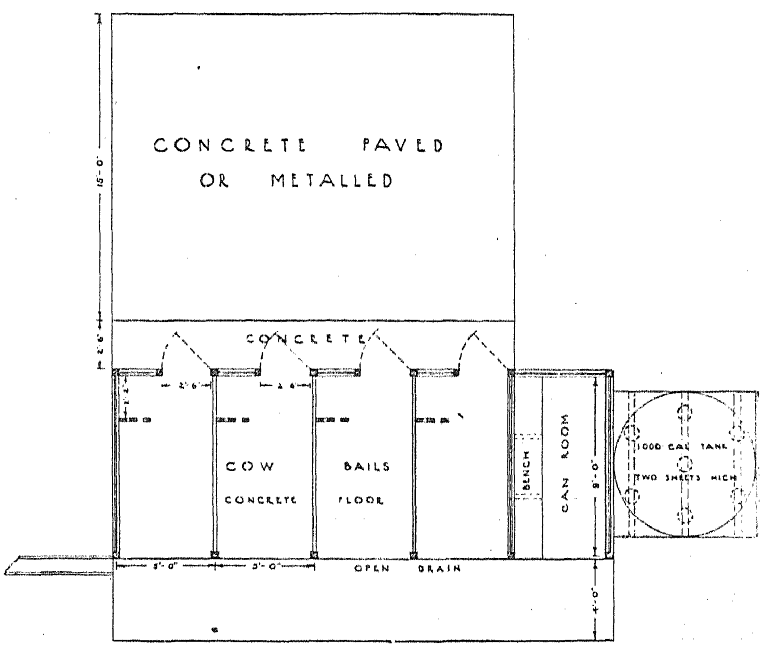
Settlers in receipt of advances must undertake to maintain their herds at the numbers stated in their applications as being already in their possession, plus any stock that may be provided by the advances, and also to maintain their plant in good order and condition and provide necessary replacements.

Settlers must proceed expeditiously with the work for which advances are made available, to the satisfaction of the Board.

Settlers in receipt of advances must not consign any milk, butter, cream, cheese or other dairy produce to any factory or person other than the company named in the application except with the approval of the Dairy Promotion Board.



SIDE ELEVATION



PLAN

Cow Bails for Hand Milking.

A Boost for Inland Dairying.

INLAND dairying got a boost the other day when Mr. A. R. Martin, of Narooma Jersey Stud Farm, Wagga, won the Dangar Gedye cup by gaining third place in the State Dairy Championship. Now "Kelvinside Brown Lustre," a Jersey cow in Mr. Martin's herd, has earned the distinction of being the first Jersey in the Riverina to produce more than 1,000 lb. commercial butter in 273 days. The cow was six years old at the commencement of her test, and her actual figures were 15,463½ lb. milk, containing 849.8 lb. butter-fat, equal to 1,023.8 lb. commercial butter.

The Use of Butter-fat in Margarine Prohibited.

WHEN the amended Dairy Industry Act comes into force on 1st March next the butter industry will be freed from the unfair competition that it has had at times in the past to meet at the hands of unscrupulous manufacturers and vendors of margarine.

The amended Act prohibits the use of the word "butter" in connection with any preparation for human consumption or the use of any device or means calculated to induce any person purchasing such preparation to believe that it is butter, unless the preparation is in fact butter, or the approval of the Minister for Agriculture is obtained for the use of the word "butter." It also prohibits even the use of coloured paper as a wrapper for margarine if by such means a purchaser is led to believe that the product is butter.

The use of butter or butter-fat in the manufacture of margarine is absolutely prohibited. Margarine and butter cannot be made in the same premises under penalty of a fine not exceeding two hundred pounds.

"Water Diviners and their Methods."

To those who are interested in the use of the divining rod the translation of the work of M. Henri Mager, one of the most important of several French books on the subject, will be welcome. The book traces the history of water divining since the earliest records of the practice—as long ago as the seventeenth century—and records the methods adopted by many water diviners. Chapters are devoted to such methods as intuitive perception, the pendulum, the forked rod. and other means of divining

M. Mager spent many years in an attempt to discover a more rational explanation of the phenomena than the still popular psychic interpretation, and in this book sets down his own explanation based simply on the physical properties of matter. He describes new methods of detection, such as the use of colour detectors, and in the concluding chapters sets out the methods of water location and analysis he himself employs.

Our copy from the publishers, G. Bell and Sons, Limited, London.

The Empire's Best Butters.

SCIENTIFIC VERDICT FOR AUSTRALIA.

ONCE again scientists have brought their knowledge into the realm of every-day things. They have recently experimented with a commodity necessary to every household, and have found that the vitamin value of Australian butter is as great as that of the best English summer butter. The details and results of the scientific investigation (made possible through the aid of the London Empire Marketing Board) are available in a report issued by the Medical Research Council on the "Vitamin Content of Australian, New Zealand and English Butters." The findings in this report should do much to increase the sale of Australian butter in the United Kingdom.

The prominence given to-day to food values and the vitamin contents of foodstuffs, coupled with the fact that Britain must obtain some of her supplies from overseas, emphasises the importance of knowing that those which come from far-distant dominions can be accepted alongside the best that can be produced at home. This especially affects butter which possesses the two fat-soluble vitamins A and D. Vitamin A is essential to growth and helps resistance to disease, whilst Vitamin D (the rickets-preventing factor) is necessary for the formation of strong bone and good teeth. The presence of these accessory food factors in butter makes it a most valuable food for children and gives it a place among the preventive medicines, for it forms a regular item in the normal person's diet.

The tested butters were subjected to a rigid examination, beginning with a study of the cows supplying the cream, of the conditions under which they were living, of the treatment of the cream, and details of every process involved from the time when the butter left the farms in Australia until its arrival in England. To estimate the vitamin content tests were made with rats, whose previous family record was available. Two groups were used, the members of one being fed on an ordinary diet, the others receiving food from which vitamin A had been excluded. The rats on the restricted diet lost their glossy coats; their energy and their weight declined; some even developed disease. Their impoverished condition was arrested by daily doses of butter, and the ailing animals began to put on weight and to recover their spirits. Experiments were also carried out which demonstrated the presenec of vitamin D and its necessity to the healthy life of the rats.

Cold Storge no Detriment.

The vitamins in Australian butter were also found to have remarkable stability during cold storage. The value of the vitamin content was tested soon after the butter arrived in England. The results were considered together with the information given about the state of the butter when it was first graded and packed, and no appreciable difference in the vitamin

potency of the sample was found to exist. The same butter was tested after it had been in cold storage for at least two years, and even after that length of time the general conclusion was justified that no notable depreciation of food value had taken place. These experiments—so satisfactory in their results—demonstrate clearly that Australian butter suffers no ill effects during the two or three months which customarily elapse between the time of their production and of its consumption.

The butter subjected to this rigid scrutiny was prepared from mixed breeds and Jersey cows which had been on open pasture throughout the year. The racial origin of the cows appeared to be without significant effect on the vitamin content.

The Winter Market in Britain.

A perusal of the report of the Medical Research Council leaves no doubt of the thoroughness with which Australian butter was examined. It was produced by herds having the benefit of long hours of sunshine in the southern hemisphere. It is known that the vitamin content of milk and butter produced in northern countries during the winter months suffers considerably from insufficient sunlight, and from the necessity of stall-feeding for the cows. The importance, therefore, of being able to procure through the winter butter which is as rich in food value as the best English summer butter and as that prepared from the cream of cows fed with food especially rich in fat soluble vitamins, is very great.

The Empire Marketing Board has made it possible for scientists to demonstrate that Australian butter has a high and uniform vitamin potency which persists despite differences in methods of production and difficulties of transport. This news, we are given to understand, is particularly welcome to the British people, for it enables them to obtain excellent Empire butter in winter as well as in summer.

A Downward Trend in Beef Consumption.

A REPORT issued recently by the Empire Marketing Board dealing with the production and trade in livestock and meat points out that it is very evident that there has been in recent years a downward trend in beef consumption and a swing over to pork and mutton, both in countries which normally consume more beef than pork and in those where pork is always the more popular meat—chiefly North America, Germany, and some other countries of northern Europe. Between 1925 and 1930 beef and veal consumption in the United States fell from 71 to 57 lb. per head, while pork and lard rose from 81 to 82 lb. and mutton and lamb from 5¼ to 6¼ lb. per head. In the United Kingdom beef consumption fell from 72 to 66 lb., while pigmeat and mutton rose respectively from 39 to 43 lb. and from 26 to 28 lb. In Canada beef fell from 70 to 58 lb., while pork rose from 72½ to 81½ lb. and mutton and lamb from 5 to 7 lb.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1933
Wollongbar Experiment Farm, Lismore (Guernseys)	119	3 ,, 1933
Lidcombe State Hospital and Home	149	3 ,, 1933
G. L. Genge, " Easton," Armidale	33	4 ,, 1933
A. N. de Fraine, Happy Valley Dairy, Inverell	9	6 ,, 1933
W. Pigg, Redlands Dairy, Inverell	33	6 ,, 1933
W. T. Herbert, Racecourse Farm, Bega	40	7 ,, 1933
C. J. Parbery, Allawah, Bega	108	8 ,, 1933
A. B. Finney, Fox Ground, Gerringong	29	11 ,, 1933
J. Davies, Puen Buen, Scone (Jerseys)	147	14 ,, 1933
Newington State Hospital and Home	100	17 ,, 1933
George Rose, Aylmerton	3	23 ,, 1933
Riverina Welfare Farm, Yanco	89	24 ,, 1933
Department of Education, Yanco Agricultural High School	39	24 ,, 1933
Mittagong Farm Homes	36	24 ,, 1933
J. B. Burtenshaw, " Sunnyside," Inverell	36	27 ,, 1933
Parker Bros., Hampton Court Dairy, Inverell	74	27 ,, 1933
W. K. Frizell, Rosenstein Dairy, Inverell...	44	28 ,, 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	21	28 ,, 1933
Liverpool State Hospital, Liverpool	72	3 Mar., 1933
Miss Brennan, Arankamp, Bowral	17	8 ,, 1933
G. W. Young, " Boorganna," via Wingham	41	10 ,, 1933
Lunacy Department, Kenmore Mental Hospital	80	27 ,, 1933
P. M. Burtenshaw, Killean, Inverell	66	6 April, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra	20	6 ,, 1933
A. D. Frater, " Fairview Dairy," Inverell	51	6 ,, 1933
A. H. Pye, Loch Levan, Inverell	47	7 ,, 1933
W. Newcomb, " Minnamurra," Inverell	72	7 ,, 1933
Rydalmere Mental Hospital	77	7 ,, 1933
St. Joseph's Girls Orphanage, Kenmore	11	13 ,, 1933
St. Joseph's Convent, Reynold-street, Goulburn	3	14 ,, 1933
St. Michael's Novitiate, Goulburn	4	14 ,, 1933
Marion Hill Convent of Mercy, Goulburn	47	15 ,, 1933
G. A. Parish, Jerseyland, Berry	93	21 ,, 1933
Australian Missionary College, Cooranbong	72	5 May, 1933
W. M. McLean, Five Islands Road, Unanderra	76	6 ,, 1933
Koyong School, Moss Vale	3	11 ,, 1933
Tudor House School, Moss Vale	21	13 ,, 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	226	2 ,, 1933
W. Hammond, Bellingen	77	16 ,, 1933
Hurlstone Agricultural High School, Glenfield	44	22 ,, 1933
E. C. Nicholson, Jillamatong, Corowa	180	23 ,, 1933
St. John's College, Woodlawn, Lismore	47	23 ,, 1933
Grafton Experiment Farm	271	14 July, 1933
P. Ubrihien, Corridgeree, Bega	123	15 ,, 1933
William Thompson Masonic Scool, Baulkham Hills	37	20 ,, 1933
A. Shaw, " Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 ,, 1933
G. V. Ralston, " Porphyry," Seaham	98	21 ,, 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook	37	17 Aug., 1933
A. L. Logue, Thornboro, Muswellbrook	36	17 ,, 1933
E. W. Flower, Binna Burra	56	18 ,, 1933
E. P. Berry, Nundorah, Parkville (Guernseys)	30	25 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	43	25 ,, 1933
Sacred Heart Convent, Bowral	10	26 ,, 1933
Lunacy Department, Parramatta Mental Hospital	12	1 Sept., 1933
Department of Education, Gosford Farm Homes	38	2 ,, 1933
James McCormack, Tumut	98	9 ,, 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1933
G. Powell and Sons, " Loch Lomond," Armidale	22	26 ,, 1933
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1933
E. E. McMullen, Springnook, Holbrook	31	3 Nov., 1933
W. R. Boughton, Holbrook	33	3 ,, 1933
C. Maynard, Holbrook	12	3 ,, 1933
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1933
Stace Bros., Taylor-street, Armidale	26	1 Dec., 1933
J. L. W. Barton, Wallerawang	20	1 ,, 1933
Department of Education, Brush Farm, Eastwood	8	3 ,, 1933
Lunacy Department, Morisset Mental Hospital	27	7 ,, 1933

Tubercle-free Herds—*continued.*

Owner and Address.	Number tested.	Expiry date.
W. W. Martin, "Narooma," Urana Road, Wagga	150	14 Dec., 1933
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1933
E. E. Winder, Wybong Road, Muswellbrook	40	22 ,, 1933
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay ...	8	9 Jan., 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	80	22 ,, 1934
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1934
New England Girls' Grammar School, Armidale	29	3 Feb., 1934
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 ,, 1934
St. Patrick's College, Goulburn	8	21 Sept., [illegible]
S. L. Wills, Greendale Dairy, Cowra	28	27 ,, [illegible]
Wagga Experiment Farm (Jerseys)	53	25 Oct., [illegible]
Riverstone Meat Co., Riverstone Meat Works, Riverstone	[illegible]	9 Nov., [illegible]
Wolaroi College, Orange	[illegible]	16 [illegible]

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis :—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—Max Henry, Chief Veterinary Surgeon.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1933 planting season :—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son, Carlingford	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson, Ermington ...	2,000	2,000	700	1,000	500	6,200
Swane Bros., Ermington ...	1,000	1,000	250	500	500	3,250
Geo. McKee, Ermington ...	1,000	2,000	...	...	...	3,000
C. Langbecker, Bundaberg, Queensland	...	750	...	...	250	1,000
F. Ferguson and Son, Hurstville	2,000	3,000	...	...	...	5,000
A. T. Eyles, Rydalmere ...	3,000	2,000	...	...	...	5,000
R. Hughes, Ermington ...	500	500	250	500	1,000	2,750

—C. G. Savage, Director of Fruit Culture.

Orchard Notes.

February.

C. G. SAVAGE and H. BROADFOOT.

Export of Apples.

During the next few weeks growers will be busy picking and packing apples for export. The number of cases of apples which are likely to be shipped to overseas markets by New South Wales growers this season promises to be a record.

The following remarks should be of particular interest to intending exporters.

Packing.

Though growers are now generally conversant with space packing, there are two points worth referring to—bulge and type of pack. Some people have the idea that apples shrink very considerably after being packed, but this is not so. Apples picked at anything like maturity shrink very little. Packers, having the idea of considerable shrinkage in their minds, often pack excessively high in the cases, and this causes much bruising of the contents. If the apples are packed firmly in the tiers there is no need to finish the case with a big bulge, for the apples settle down very little. Packing too high is as bad as, or worse than, packing too low.

The closed-edge pack, when it can be used, is desirable. It cannot always be used—as for example in the "north-west" box. If a closed-edge pack cannot be used the apples should be packed flat.

Use Standard Cases.

The type of case, too, is important, and it is stated without hesitation that the standard box (18 inches by 10½ inches by 11½ inches, internal measurements) is much better than what is known as the Canadian case (20 by 10 by 11⅛ inches, internal measurements), and the sooner all growers use the former the better. It is not wise for different States to use varying types of cases for packing, as when different types are loaded into a vessel's hold the stowage is broken, stacking is more difficult, and the circulation of air and ventilation are interfered with. Growers are therefore advised not to persist in using the older style of case (20 by 10 by 11⅛ inches), but to replace them as they are used up by the 18 by 10½ by 11½ inches case, which is undoubtedly superior and is used by all the chief apple-producing countries of the world.

Attractive Labels are an Advantage.

There is no doubt that a well-designed, artistic label on a fruit case has a decided advantage over the old stencil. It attracts attention and prejudices the onlooker in favour of the contents of the case, and certainly is much more impressive than the stencil.

It is unfortunate, however, that we have so many growers shipping fruit from Australia each using a different label. It would be much better for our export trade if we had district labels. The sorting, stacking, and cataloguing of Australian apples, owing to the multiplicity of brands, etc., is far more costly than of American apples. This point is always stressed by firms when the cost of handling and selling Australian apples is being discussed. Many growers would take strong objection to using a district label, but there is no doubt that they will have to think and act along these lines sooner or later.

Another point to be stressed, and this applies to both the stencil and label, is that the markings on many cases can scarcely be read. Poor markings lead to rough handling and delay in sorting and stacking. When a cargo is being discharged a number of men are engaged to pick out the various growers' brands and stack the cases according to size, grade and variety. There is a great deal of confusion when a cargo of apples is being discharged from a hold and the apples have been forwarded by a number of growers under their own brands, each forwarding several grades of a number of different sizes and varieties. When the markings on the case are easily decipherable it is bad enough, but it is worse still when the markings are hard to decipher.

Thee Use of Corrugated Cardboard.

The use of corrugated cardboard for sides, tops and bottoms of cases is strongly recommended. Used in conjunction with attractive strong cases it considerably reduces bruising, which is caused by rough handling of cases, etc. Cases in which corrugated cardboard is used has an advantage even over those in which wood-wool is placed on tops and bottoms. The cardboard acts as a cushion or spring on all sides and takes the jar when the case gets a jolt during rough handling.

Low-Grade Fruit.

It might be imagined that there is a ready market for fruit of inferior as well as superior quality, the former being in demand by the poorer classes. Careful investigation, however, has definitely established the fact that the country which supplies low-grade fruit will have its higher grade fruit looked upon with suspicion, with a consequent shrinkage in demand and price.

The Chief Varieties for Export.

The chief varieties of apples produced in New South Wales are Granny Smith, Jonathan, Democrat, Cleopatra, London Pippin, Rome Beauty, Dunn's, and Delicious.

Granny Smith.

Sizes from 2½ to 3 inches sell well in the export market. Granny Smith stands up to fairly hard conditions. It is, however, susceptible to scald if kept for long periods in cold storage.

Growers of Granny Smith apples in New South Wales should oil-wrap this variety for export. There is no doubt that there is not much danger of the Granny Smith developing scald during the voyage from Australia to England. It is only when this apple is enclosed in ordinary wrappers and placed in storage for fairly long periods that scald develops. The reason for advising growers to use oiled wraps is that this variety, because of its long storage life, will later be in great demand in England for cool storage and for railing and re-shipping to various places. Many of the Granny Smiths that arrive in England in June could be held until August or later. The bulk of the Australian apples are off the market then, and the American new season apples, principally Gravensteins, begin to arrive. During August and September Granny Smiths would more than hold their own against any other variety forwarded from the various States of Australia and would be far superior to early American apples. Granny Smith will have a very long marketing period in England—a distinct advantage to producers, brokers, and retailers.

Jonathan and Delicious.

Sizes 2¼ to 2½ inches sell best in the export markets. There is a fair demand for clean, well-coloured 2-inch Jonathan apples.

London Pippin.

The most suitable sizes are 2½ to 2¾ inches. This variety must be picked on the "green" side for export.

Cleopatra.

Sizes 2¼ to 2⅝ inches sell best. The apples should be allowed to remain on the tree until fairly well matured before picking. If picked on the immature side the fruit will very likely develop bitter pit.

Other Varieties.

Democrat, Rome Beauty, Dunn's, and Cox's Orange Pippin can be shipped in a full range of sizes, except that over-sized specimens are not in demand overseas.

In every instance the count should be marked on the end of the case in preference to the size of the apples.

Some Reminders for February.

Codling Moth Control.—All infested fruit should be collected regularly and destroyed. This must be done whilst the fruit is actually infested. If the fruit is collected in bags or cases and is allowed to remain until the grubs have escaped its collection is labour in vain.

Cultivation.—Every attention must be paid to cultural operations, and the land put in the best condition possible to conserve moisture, free the land of weeds, and in every possible way encourage blossom bud formation for the coming season.

Budding.—Budding may be continued throughout this month, provided the sap is flowing freely. Best results can only be obtained by careful selection of budding wood from proved trees. When young trees have been planted out and require a pollinator no time should be lost in making adequate provision for cross-pollination. Write to the Department of Agriculture for a leaflet on the subject of cross-pollination in the orchard.

Cross Pollination—A Warning.

Mr. Thomas, Orchard Inspector, Westmead, has brought under notice that, following an account of some trials on the cross-pollination of Willson Early Plum which was published in the September, 1932, issue of this *Gazette*, some growers contemplate budding their Santa Rosa plum trees adjacent to their Willson Early trees to Duffy's Jewel and Narrabeen. This would be most unwise, for although those two varieties did give good results for the two seasons they were tried, it must be remembered that Santa Rosa was only tried for one season in the trials, and while it gave poor results in that season, several of our coastal orchard inspectors have reported the better and more regular cropping of Willson Early when growing adjacent to Santa Rosa. Moreover, Santa Rosa is one of our best commercial plums grown in coastal districts, and although Narrabeen is an excellent plum it is rather too late for our coastal districts and liable to fly infestation. Furthermore, Duffy's Jewel, although an early plum, is liable to turn out an erratic cropper in some localities.

Green Manuring and Humus Supply.

The following topical notes have been forwarded by Mr. W. W. Cooke, Senior Fruit Instructor, who is stationed at Goulburn:—

The necessity of maintaining—or better still, of increasing—the humus in the soil of most orchards becomes more apparent each year. When virgin soil is first cultivated it usually contains a fair percentage of humus, and the fertility of a soil can, to a large extent, be judged by its humus content. Nitrogen-fixing bacteria work best in a soil containing a high percentage of humus. Also the moisture-holding capacity of a soil improves as its humus content increases. According to Bailey* the percentage of moisture held in different kinds of soil is as follows:—Sand, 25 per cent.; clay, 50 per cent.; humus, 181 per cent. It will thus be seen that the value of humus in the soil is very great.

As stated above, most orchard land contains a fair percentage of humus when first ploughed, but as time goes on in many cases the amount slowly but surely decreases, and if means are not taken to prevent this loss the soil rapidly loses its fertility, cultivation becomes more difficult, and other troubles arise.

* Bailey: "Principles of Agriculture."

The evils following the loss of humus are being recognised more each year, and the question repeatedly asked by orchardists is how best to replace the loss and to maintain an adequate supply. In most districts the only practical method to adopt is the use of green manure crops, and this is recognised and practised by orchardists in increasing numbers. Which crop to plant so as to secure a good body of green matter to plough under is a question often rather hard to answer owing to differences in climate, altitude and class of soil, and the extent to which the humus has been depleted, it being harder to grow green manure crops on land requiring humus than where the soil is of better quality. It is usually best to be guided by local experience, planting what has proved to be a success in the district.

Where field peas succeed they form an excellent green manure. One of the best plots I have seen was of Grey Partridge peas, sown in March with an application of about 1 cwt. of blood and bone per acre, the soil being of poor quality. Tick beans, lupins, and also a mixture of Golden vetch and rye have given excellent results in some orchards. What will grow best is often the best to plant, and some orchardists depend on a natural growth—grass, clover, etc.—in the orchard, giving an application of manure, usually superphosphate or bone and superphosphate, in March to encourage such growth.

Whatever method is adopted the object should be to secure a good body of greenstuff to plough under in July or not later than August. The exact time varies with the district, but if the best results are to be obtained the green manure must be ploughed under in time to be well rotted before summer cultivation commences, otherwise cultivation is delayed. Also the supply of available nitrogen is reduced at blossoming time. I have seen actual damage done by ploughing under dry vegetable matter in October.

It has often been noticeable that where an application of lime has been made the previous year the weight of green manure obtained has greatly increased. In orchards where difficulty is experienced in obtaining sufficient growth by July, an application of lime might be tried the year before the green manure is planted. Also the trial of different plants and manures, so as to find out what will succeed best in their particular orchard, would result in orchardists obtaining valuable information.

A Market for Apricot Kernels Overseas.

THE Water Conservation and Irrigation Commission recently sold 6 tons of apricot kernels (whole) to Germany at £35 per ton f.o.b. Sydney. These kernels were packed in double bags each containing 131 lb. A further consignment of about 1 ton of broken kernels, packed in double bags, was also shipped to the same country, but in this case for sale on a consignment basis.

A quantity of just under 5½ tons of whole apricot kernels, packed in double bags, was subsequently shipped to London for sale on a consignment

basis by the New South Wales Government Offices. For this latter shipment it is anticipated that 40s. to 42s. 6d. per cwt. ex store London will be realised.

Although the shipments to date are more or less of an experimental nature, it is felt that a permanent and profitable trade in apricot kernels can be worked up both in Germany and the United Kingdom. Up to the present it appears as if the main market is in Germany, where they are used both for extraction of oil and for confectionery purposes.

"Drink" More Oranges and Lemons.

ACCORDING to a report issued by the California Fruitgrowers' Exchange, the fountain drink industry in United States last year consumed 6,150,000 boxes of oranges, or 13.7 per cent. of the total orange supply. Lemons consumed in the same way in 1931 totalled over 940,000 boxes, or 15.5 per cent. of the total supply.

During the past five years sales of fresh orange and lemon drinks have increased 68.2 per cent., and 16.6 per cent. of all drinks sold are made from fresh fruit.

Queensland Grape Fruit and Orange Regulations.

THE attention of exporters of grape fruit and oranges is drawn to the Queensland regulations, which require those fruits to be packed and offered for sale in either a case with internal measurements of 18 inches long by 14¼ inches deep by 8⅜ inches wide, or one measuring internally 18 inches long by 11½ inches wide by 10½ inches deep.

These regulations were gazetted on 23rd June, 1932, and as ample time has been allowed for compliance with their requirements, the Queensland authorities have now notified their intention of strictly enforcing the law in this regard.

"CHROMOSOMES AND PLANT BREEDING."

IN "Chromosomes and Plant Breeding," a copy of which we have received from the publishers, McMillan and Co., Ltd., London, the author, Dr. C. H. Darlington, has given a concise, simple, yet thorough explanation of the nature of chromosomes and the fundamental part they play in the transmission of heritable characters. This book is not intended to cover fully the field of cytology, but is rather a brief general introduction to the study of chromosomes and their importance and bearing on practical plant breeding. Many examples are given of the problems in practical breeding which are affected by irregular cytological behaviour, and these serve as a guide to the plant breeder, particularly in the crossing of species, and also of some varieties which differ in their chromosome constitution. A knowledge of these facts enables the avoidance of much wasted effort in unprofitable fields of breeding, and guides the breeder into lines of more useful endeavour.

An Instructive Banana Exhibit.

Recognising that the continuance of the banana-growing industry in New South Wales is dependent upon the control of the major pests and diseases, and that the first step in control is identification of the trouble, Messrs. H. W. Eastwood and A. L. Fitzpatrick, banana inspectors, staged two very fine exhibits, one at the Murwillumbah and the other at the Mullumbimby show recently. These were admitted by leading banana-growers both on the Tweed and Brunswick rivers as the finest and most instructive exhibits of the kind they had ever seen. Bunchy-top was shown affecting plants in all stages of growth, and comparisons (often very puzzling, even to the experienced grower) were made between bunchy-top infected and healthy

The Exhibit at Mullumbimby Show.

plants. The banana aphid, the insect which transmits the bunchy-top disease, was also exhibited. Other minor diseases shown included leaf spot, Fijian Sigatoka disease, leaf fall and corky or dry rot. Some excellent specimens showing damage done by the banana borer also attracted much attention, while the borer itself was shown in all stages of development. The inclusion of fruit affected with banana rust caused by thrips and a bunch showing scab caused by fruit-eating caterpillars made the exhibit very complete. Leaflets on most of the diseases and pests were available to those interested, and copies of these same leaflets can still be had for the asking from the Department of Agriculture, Box 36A, G.P.O., Sydney.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Wollongong (V. Stumbles)	Feb. 2, 3, 4
Berry (G. Gillam)	„ 10, 11
Castle Hill	„ 10, 11
Moruya (H. P. Jeffery)	„ 14, 15
Guyra	„ 14, 15
Pambula (L. K. Longhurst)	„ 15, 16
Nowra (R. King)	„ 16, 17, 18
Liverpool	„ 17, 18
Wyong	„ 17, 18
Milton (G. Prior)	„ 21, 22
Tenterfield	„ 21, 22, 23
Candelo	„ 22, 23
Uralla	„ 22, 23
Newcastle (P. Legoe)	„ 22 to 25
Gunning (G. E. Ardill)	„ 23, 24, 25
Blacktown	„ 24, 25
Kangaroo Valley (L. W. Vance)	„ 24, 25
Coonabarabran	„ 28, Mar. 1
Yass (S. C. Sleeman)	„ 28, Mar. 1
Inverell (E. A. Clarke)	„ 28, Mar. 1, 2
Bega	Mar. 1, 2
Dorrigo (A. C. Newman)	„ 1, 2
Maitland (M. A. Brown)	„ 1, 2, 3, 4
Oberon	„ 2, 3
Robertson (W. G. Jenkin)	„ 3, 4
Penrith	„ 3, 4
Queanbeyan	„ 3, 4
Binnaway	„ 7
Bowraville	„ 7, 8
Taralga (W. N. Fitzgibbons)	„ 7, 8
Glen Innes	„ 7, 8, 9
Walcha	„ 8, 9
Bombala	„ 8, 9
Cobargo	„ 8, 9
Wallamba	„ 9, 10
Nabiac (A. A. M. Clarke)	„ 9, 10
Berrima (H. Richardson)	„ 9, 10, 11
Mendooran	„ 10
Luddenham	„ 10, 11
Cessnock	„ 10, 11
Rydal (H. Murray)	Mar. 10, 11
Mudgee (T. P. Gallagher)	„ 14, 15, 16
Armidale	„ 14, 15, 16
Braidwood (H. E. Roberts)	„ 15, 16
Macksville	„ 15, 16
Cooma (G. E. Metcalfe)	„ 15, 16
Crookwell (A. G. McDonald)	„ 16, 17, 18
Bowral (E. Waine)	„ 17, 18
Parramatta	„ 17, 18
Gulgong	„ 21, 22
Bellingen (J. F. Reynolds)	„ 21, 22, 23
Tamworth	„ 21, 22, 23
Gloucester	„ 22, 23
Bemboka	„ 22, 23
Goulburn (T. Higgins)	„ 23, 24, 25
Campbelltown (R. A. Sidman)	„ 24, 25
Quirindi	„ 28, 29, 30
Camden (Chas. New)	„ 30, 31, Apl. 1
Taree (C. A. Jackson)	„ 30, 31, Apl. 1
Dungog (W. H. Green)	„ 30, 31, Apl. 1
Gunnedah (R. A. Brown)	April, 4, 5, 6
Sydney Royal (G. C. Somerville)	„ 10 to 19
Kempsey (E. E. Mitchell)	„ 26, 27, 28
Gresford (A. R. Brown)	„ 28, 29
Orange (G. R. Williams)	May, 2, 3, 4
Grafton (L. C. Lawson)	„ 3 to 6
Dubbo Diamond Jubilee (F. W. K. Wise.)	„ 16, 17
Casino (E. J. Pollack)	„ 17, 18
Tullamore (W. J. Colville)	July 26
Peak Hill (W. R. L. Crush)	Aug. 1, 2
Trundle (D. Leighton)	„ 8, 9
Condobolin (J. M. Cooney)	„ 15, 16
Bogan Gate (J. T. a'Beckett)	„ 23
Parkes (L. S. Seaborn)	„ 29, 30
Forbes (E. A. Austin)	Sept. 5, 6
Narrandera (J. D. Newth)	Oct. 3, 4
Leeton (E. C. Tweedie)	„ 10, 11

All-night Lights Speed-up Layers in U.S.A.

Attention has been directed to all-night lights for layers by the experimental work carried on for some time at the Ohio Experiment Station, U.S.A. Tests with this newer method seem to indicate that it is the most efficient way of realising the value of artificial illumination. Pullets and hens under all-night lights laid considerably more eggs than those without lights, or those with morning lights at 4 a.m. No ill effects upon fertility or hatchability resulted from their use.

This newer method was especially effective in bringing slow-maturing and somewhat defective pullets into good production. All-night lights prevented a premature moult and were especially helpful in the return to production of pullets which started to moult in October and November. And a lighted hen-house should discourage theft.—*Country Gentleman*, U.S.A., Dec., 1932.

Poultry Notes.

FEBRUARY.

E. HADLINGTON, Poultry Expert.

Preparing for a Green Fodder Supply.

ON many poultry farms provision is not made for an ample supply of green feed which is an important factor in maintaining healthy and profitable flocks. Suitable greenstuff provides essential vitamins, acts as a tonic, and also assists in keeping the digestive tract in a healthy condition. Moreover, where abundant green fodder is available a saving in the feed supply can be effected by using up to 20 per cent. by measure of finely chaffed lucerne, clover, barley, oats, etc., in the morning mash, replacing a large proportion of the bran. At the same time additional greenstuff may also be given at midday, or in the summer time towards evening. It should not be thought, however, that an unlimited quantity when available can be used in the mash, as this would lead to reduced production on account of replacing more concentrated food.

Those who desire to provide additional greenstuff should make preparations for planting as soon as possible, particularly for crops such as lucerne, barley, rape, kale, etc. In many cases the cultivation of the land for green feed crops is left until the time for planting arrives, and consequently the ground is not in a suitable condition to ensure the crop becoming properly established. This applies particularly to land which has been overgrown with grass or weeds, and in such cases it is essential that the ground be cultivated a number of times before the crop is sown. What happens when the ground is not thoroughly clean is that weeds and grass come up with the crop and choke it out before it becomes established.

Crops that can be Sown Now.

Where it is desired to augment the green feed supply as soon as possible, crops such as barley, rape, kale and silver beet may be planted this month and next, and if additional lucerne is required no time should be lost in preparing the ground for planting next month or April. Of the numerous crops which can be used for green feed, lucerne is the most satisfactory owing to the fact that, if kept properly cultivated, manured and watered, cuttings may be made throughout the year, with the exception of the coldest winter months, when it is more or less dormant. Another factor in its favour is that it will last for a period of seven to ten years according to the class of soil and treatment.

During the months when lucerne is more or less at a standstill, crops such as barley, rape, kale and clovers, would come in if planted during March and April. Berseem clover has become popular during recent years as a green feed crop for winter requirements, but owing to the fact that seedsmen are prohibited from selling seed if it contains seed of Hexham scent, great difficulty is experienced in obtaining seed. Those who are

unable to secure Berseem clover seed could use red clover as a substitute, but it is not quite as rapid in growth as Berseem clover and cannot be cut as frequently. For use on poultry farms red clover may be sown during next month and April for cutting during the winter months. It can be planted in drills and treated in the same manner as Berseem clover. Unlike the latter, however, a stand of red clover will last for about three years, given proper attention.

A Cropping Programme.

The following information supplied by the Director of Agriculture shows the crops which may be planted each month to provide a supply of green feed throughout the year:—

WHEN TO SOW CROPS.

Month.	Crops.	Month.	Crops.
January ...	Maize, cowpeas	June ...	....
February ...	Maize, barley, rape, field peas, kale, silver beet (spinach).	July ...	Rye.
		August ...	Silver beet.
March ...	Lucerne wheat oats, rape, barley, field peas, kale, silver beet.	September	Hungarian millet, maize, lucerne.
		October ...	Cowpeas, maize, Hungarian millet, lucerne.
April... ...	Lucerne, oats, barley, field peas, kale, red clover, Bokhara or sweet clover, silver beet.	November...	Cowpeas, maize, Hungarian millet.
		December	Cowpeas, maize.
May	Lucerne, clovers, oats, barley, silver beet.	......	....

WHEN CROPS ARE AVAILABLE.

Month.	Feed available.	Month.	Feed available.
January ...	Lucerne, cowpeas, maize, silver beet.	July ...	Wheat, oats, barley, rape, field peas, kale.
February ...	Lucerne, cowpeas, maize, silver beet.	August ...	Wheat, oats, barley, rape, kale, field peas, rye.
March ...	Lucerne, cowpeas, maize, silver beet.	September	Clovers, oats, barley, field peas, rye.
April... ...	Lucerne and clovers, wheat, oats, cowpeas, silver beet, barley, rape, maize.	October ...	Lucerne and clovers, field peas, silver beet.
		November...	Lucerne and clovers, maize, Hungarian millet.
May	Lucerne and clovers, cowpeas, silver beet, barley, rape, kale.	December	Lucerne, maize, Hungarian millet, and clovers.
June ...	Wheat, oats, barley, rape, field peas, kale.		

In the case of lucerne, clovers, rye, rape, kale and silver beet, repeated cuttings may be made; these are allowed for in the table. The availability of these feeds as shown is to some extent contingent on rainfall or a good water supply.

For Best Results with Lucerne.

Lucerne can be grown on almost any land in the County of Cumberland, provided that a permanent water supply is available and poultry or other suitable manure is applied in a proper manner. Good crops can be grown under these conditions, even on poor, sandy soil.

Prior to planting lucerne it is advisable to fallow the land, and where this is done it is only necessary to plough to a depth of about 4 inches prior to sowing. After this ploughing the ground should be thoroughly harrowed and rolled to break it up to a fine tilth. In the case of heavy soils a further harrowing is advisable after the rolling to prevent caking after rains.

In most areas in the counties of Cumberland and Northumberland it is best to sow lucerne in drills 18 to 24 inches apart, rather than to sow broadcast as is done in lucerne-growing country. By sowing in drills it is possible to cultivate between the rows and apply frequent dressings of poultry manure, which should be allowed to rot before being dug in. Fresh manure should not be applied too close to the roots, as it may cause injury and kill off some of the plants. For the coastal districts, Hunter River and Tamworth varieties of lucerne are most suitable. Only the best seed obtainable should be secured, and it should be insisted that the seed is free from weed seeds. About 10 to 12 lb. of seed per acre will usually be found sufficient for planting as described.

It is a mistake to attempt to grow a larger area of green feed than can be properly attended to, as this results in the crops being neglected and becoming overgrown with weeds. A small area which can be watered with an overhead spray and which may be given the necessary attention in the way of cultivation and manuring will provide more green feed than a much larger area which is neglected.

Killing and Dressing Poultry.

Enquiries are received from time to time regarding suitable methods of killing and dressing poultry, and in order to meet the demand for such information the following particulars may be of assistance to poultry-farmers who desire to augment their income by selling dressed poultry.

Where it is practicable to undertake the topping off of cockerels prior to killing, extra weight and improvement to the flesh can be effected by the treatment outlined in last month's "Notes," but if it is not possible to undertake topping off under proper conditions it is preferable to allow the cockerels to run on free range right up till the time of killing.

Fasting and Killing.

Before killing the birds it is advisable to allow them to fast for eighteen to twenty-four hours, but water may be given during the first twelve hours, as this will assist in clearing the digestive tract and does not cause such shrinkage as when water is withheld for the whole period. Fasting not only improves the flavour and tenderness of the flesh, but renders the process of cleaning more hygienic.

In England and America killing in commercial packing houses is mostly done by the sticking and de-braining method. Sticking consists of severing the jugular vein by piercing it through the mouth of the bird, thus ensuring proper bleeding, while at the same time the brain is pierced, paralysing the nerves of the bird and thus assisting the operation of plucking by causing a loosening of the feathers. This method requires practice to become proficient, and it is necessary to have a proper knife for the purpose.

Dislocating the Neck.

For the average poultry-farmer the simplest and cleanest method is to dislocate the neck, which becomes a simple process after a little practice. Those who are not accustomed to killing birds in this way should practise on dead fowls first. To carry out the operation the legs of the birds should be held firmly in the left hand, head downwards; next grasp the head between the thumb and first finger, lightly holding underneath the beak with the remaining fingers, the body of the bird being stretched across the operator's legs in a standing position. The head is bent back slightly and with a sharp downward pressure the neck is easily dislocated, and, if done properly, will break without causing the bird any suffering. After the neck is felt to break the pressure should be continued until the head is separated from the neck by about 2 inches so as to sever the spinal chord and the jugular vein. The blood then accumulates in the cavity thus formed. In killing young birds care is necessary to prevent pulling the head right off, owing to the tender nature of the skin. This method, however, would not be suitable for birds intended for storage, but where they are to be sold direct to consumers it is quite satisfactory.

Semi-scald Process of Plucking.

Plucking for the local market may be done either by the dry or semi-scald process. The latter is much easier for unskilled operators.

If it is decided to adopt the semi-scald method, provision should be made for some class of boiler in which the water can be maintained at a fairly even temperature. The best plan is to kill several birds at a time, and after the muscles have ceased their convulsions the birds may be immersed in the scalding water. If desired, they may first be dipped in cold water to wet the feathers so that the scalding water will penetrate more evenly. The temperature of the water should be maintained as near as possible between 125 and 130 deg. Fahr., and the birds should be immersed for thirty to forty-five seconds, according to their age. The main consideration, however, is to have the water hot enough to loosen the feathers without causing discolouration or rubbing of the skin. If the water is kept at the correct temperature it will be found that the feathers will come out readily and there will not be the same risk of tearing the skin as there is in the dry plucking method. If the birds have to be packed shortly after dressing they may be cooled down by placing them, after plucking, into cold water for about ten minutes in order to reduce the internal temperature, after which they should be hung on racks to dry before drawing.

Dry Plucking.

Whilst most poultry-farmers have had some experience in dry plucking birds, there are perhaps a few points which are not familiar to many, and if a definite procedure is followed it will be found more simple than is generally thought. To facilitate the work it is advisable to have some means of suspending the birds with legs apart so that both hands are free to remove the feathers. A simple hanger can be made out of No. 8 galvanised wire in the shape of a large "W" with the top ends of the W brought round to hang on a nail; the feet of the bird are then placed in the two forks of the W and are held in the bottom of the forks by the feet. The hanger should be at a height which will allow the wings of the birds to be on a level with the elbows of the operator.

The first procedure is to hold the wings firmly in the left-hand and, with the right thumb downwards, grasp the tail, and then with an outward turn of the wrist the feathers can be twisted out. Next hold the wing in the left hand, and with the right hand grasp as many feathers as possible, and with a sharp downward movement jerk the feathers out. The feathers of the breast and sides should be removed by taking handfuls, holding the hand with thumb outwards and pulling up and out, twisting the forearm outwards, at the same time keeping the skin taut with the other hand. The same procedure should be followed up the thighs. The twisting motion prevents tearing of the skin. The feathers on the legs can be removed in the same way, or by holding the leg firmly at its base and moving the closed hand, thumb upwards, along the leg with sufficient pressure to strip the feathers, working in the direction of the base of the feathers. This should only be done once and the remaining feathers must be pulled out in the ordinary way. The back and hip feathers should be removed by grasping them with the palm of the hand downwards and rotating the forearm inwards with a scraping motion. The small feathers between the shoulders may be pulled out with the thumb and forefinger. The neck feathers can be stripped by holding the neck, with the thumb upwards, around the base and stripping downwards, after which the remaining feathers should be pulled out with the thumb and finger.

In plucking the wings care is necessary to prevent tearing. The wings should be stretched out and the feathers removed in small bunches with the thumb and finger. The stiff feathers remaining in the wings must be pulled out separately by bending them sharply downwards and jerking quickly. Pin and other small feathers may be removed with a blunt knife, taking the feathers between the thumb and the blade of the knife. The hairs and any down which may be left on the bird should be singed, either with a paper torch or over a gas flame, etc.

After plucking, the bird should be hung on a rack to cool. Where only small numbers are being handled, a rail with nails at intervals of a few inches will be found quite satisfactory. The rail should be suspended away from the wall so that the air may circulate around the birds.

Drawing.

The first procedure in drawing the birds is to cut off the head and then the neck near the shoulders, after which an incision should be made in the skin of the neck through which the crop can be loosened to facilitate cutting or pulling it out together with the windpipe. Any blood and the glands attached to the skin of the neck should be scraped off with a knife to improve the appearance of the bird. The skin may then be folded over and tied up or, if desired, wrapped in a piece of parchment paper.

To remove the internal organs a slit should be made across the abdomen just large enough to insert the hand for loosening and removing the organs. After making the incision the fingers should be worked around the various organs to free them from the membranes or ligaments so that they can be easily removed. If the birds have been starved for the necessary time before killing, the task will be much easier than if the digestive tract is full. Moreover, there is not the same risk of breaking the intestines, which would necessitate washing out the body cavity. Washing is undesirable and not necessary if the work is carried out under hygienic conditions. Water coming into contact with the flesh tends to lower the keeping qualities of the bird. There is no objection, however, to washing any blood stains off the outside skin to improve the appearance of the carcase.

When dressing birds for sale direct to consumers the giblets, comprising the heart, liver, gizzard, and the cut-off portion of the neck, are usually placed inside the bird after drawing. The contents of the gizzard are emptied by cutting through the thick muscular wall, taking care not to cut the lining skin. It is then possible to separate the outside from the food-containing sac without breaking it. Care is necessary when removing the liver not to break the gall bladder, which should be cut away from the liver before the latter is put inside the bird with the other portions of the giblets.

To Make the Selling of Table Birds Profitable.

At the Poultry (Table Birds) Conference, held in the Board-room of the Department of Agriculture on 23rd January, the following resolutions were among those adopted:—

That consideration should be given to the question of selling poultry by weight and not by the pair.

That public facilities should be provided for the slaughter and preparation of dressed poultry, and that such facilities should be associated with adequate provision for the protection of public health and for cold storage.

That standards and grades for dressed poultry should be introduced and enforced at an appropriate stage.

That arrangements should be made for the regular sale of dressed poultry, guaranteed as to both grade and quality, in butchers' as well as other suitable shops.

That a registration be enforced on everybody in the county of Cumberland who kills poultry for commercial use, and also that a set of satisfactory conditions be laid down under which birds shall be killed.

CONTENTS.

Agricultural Gazette of New South Wales.

The Farmer His Own Experimenter.

WHEAT AND OAT TRIALS, 1932.

The system of demonstrating the superiority of varieties and cultural practices on private farms is one of the most valuable features of the Department's work, and certainly the most convincing to the farmer, since he carries out the work himself, or at least it is carried out under his direct supervision. The lessons taught by this means have brought about many radical changes in farming, and they have been brought about rapidly, considering the conservatism of the average farmer. Particularly in wheat farming have these changes been in evidence during recent years. Old and unsatisfactory varieties have been forced out of cultivation, while the benefits of fallowing, fertilising, the use of pure seed, etc., have been demonstrated.

There were 839 farmers' experiment plots conducted last year. They included all the main crops, besides some vegetable crops and pastures, and were widely distributed throughout the agricultural areas of the State. The results of these farmers' experiments never fail to stimulate keen interest on the part of those engaged in the same line of farming. They are not carried out for the particular benefit of the farmers on whose properties the plots are located, but for the information and guidance of all. For much of their value, therefore, these results are dependent upon a wide publicity.

New Wheats Do Well in the North-west.*

WHEAT variety, fertiliser and rate of seeding trials, also oat variety trials, were continued at a number of centres in the north-western district last season.

The season was a difficult one, being punctuated by long dry spells, while very severe frosts were also experienced in some parts. Further details of the season, as well as rainfall registrations at the various centres, both during the fallowing and growing periods, are given in the report of the wheat-growing competitions in this district (see page 218 of this issue).

Wheat Variety Trials.

The accompanying table gives full details in connection with this trial. Generally speaking, all varieties yielded well in the more favoured parts of the district and where the trials were sown on winter fallow.

The requirements in a variety suitable for north-western conditions are strength of straw, resistance to disease, particularly rust, combined with yielding capacity. It is strange that the varieties that are yielding well are not over-strong in the straw and are fairly tall growers, *e.g.*, Ford, Nabawa and Waratah. The stouter-strawed varieties like Federation and some of its progeny are not suitable for the north-west owing to their susceptibility to disease.

*** Details under this heading were taken from report of the experiments by Mr. J. A. O'Reilly, Agricultural Instructor.**

Throughout this season's trials Canimbla consistently outyielded Currawa and in most cases yielded better than Nabawa, which variety was taken as a standard for wheats of similar season. Burrill and Lawson yielded well, both yielding better than Nabawa. Baringa showed signs of tipping at some centres, but despite this it yielded well. It holds its grain tightly, but this season it stripped fairly readily. Dundee did not yield generally as well as Nabawa, the grain at some centres being pinched by rust. It is worthy of further trial. The yielding capacity of Ford and Nabawa was watched closely this season. Generally, Ford yielded better than Nabawa.

Geeralying yielded better than Clarendon this season, although it behaved more satisfactorily last season. It was affected by frost. Waratah generally was slightly superior to Geeralying. Pusa No. 4 on the whole was not as good as Waratah and Geeralying and for the past two seasons has not been outstanding and cannot be considered as a variety for main sowing in this district. Aussie behaved satisfactorily and in most trials yielded better than Waratah, being quite a useful variety under north-western conditions. It is susceptible to flag smut, but with good cultural methods and treatment satisfactory returns can be obtained from the variety. In these trials Waratah was used as a standard for comparison with varieties of similar season.

How Much Seed Wheat Per Acre?

Rate of seeding trials carried out at Inverell and Boggabri indicated that from 45 to 50 lb. seed per acre gives the best results.

At Inverell the trial was carried out on Mr. C. Anderson's Swan Vale farm, where the soil is a basaltic loam. It was mouldboard ploughed in April, harrowed in May, springtoothed in June and harrowed. Sowing was done with a combine, Ford on 19th July and Waratah on 4th July.

The Boggabri experiment was conducted on Mr. J. Penfold's farm. The soil is a chocolate loam, which was mouldboard ploughed in January, springtoothed in March and sown with a combine on 12th May.

YIELDS in Rate of Seeding Trial.

Rate of Seeding.	Inverell.		Boggabri.
	Waratah.	Ford.	Duri.
	bus. lb.	bus. lb.	bus. lb.
30 lb. per acre	39 42	44 20	....
35 lb. ,, ,, ...	....	....	29 25
43 lb. ,, ,, ...	44 33	48 28	....
45 lb. ,, ,, ...	....	....	28 48
55 lb. ,, ,, ...	....	....	30 0
58 lb. ,, ,, ...	40 18	42 39	....

At Boggabri the 45 lb. and 55 lb. plots lodged and slight loss of grain occurred.

CULTURAL Details and Yields of Wheat Variety Trials, North-western District, 1932–33.

District and Experimenter.	Nature of Soil.	Ploughing.	Cultivation.	Date of Sowing.	Seed per acre.	After Treatment.
					lb.	
Curlewis (W. O. Manning).	Gravelly loam.	Disc ploughed December.	Springtoothed Jan., disced Feb., sown with combine.	31 March ...	45	Fed off April and July.
Curlewis (F. McClintock).	Medium to sandy loam.	Disc-ploughed August.	Disc-cultivated Dec., springtoothed Jan., Feb., and March, sown with combine.	25 April (late varieties), 21 May (others).	50	...
Narrabri (W. McCutcheon).	Chocolate loam.	Disc-ploughed November.	Harrowed twice, sown with combine and harrowed after.	20 April ...	43	Fed off in June.
Emerald Hill (E. S. Perrett).	Chocolate loam.	Disc-ploughed September.	Springtoothed and harrowed Jan., sown with combine.	3 May ...	45	...
Culgoora (S. Carberry).	Greyish belar loam.	Mouldboard ploughed May, 1931.	Disc-ploughed Sept., springtoothed Feb., sown with combine.	8 April (late varieties), 21 April (others)	46	...
Inverell (G. S. Thomas).*	Black basaltic loam.	Mouldboard ploughed July.	Sown with combine	15 July ...	58	...
Boggabri (J. B. White).	Black self-mulching loam.	Mouldboard ploughed August.	Springtoothed Feb., harrowed Mar. and April, sown with combine.	22 April (late varieties), 6 May (others).	43 and 48.	Early sowings fed off.
Boggabri (C. Evans).	Chocolate loam.	Springtoothed March.	Sown with combine	28 April ...	50	...
Boggabri (W. L. Laird).†	Chocolate loam.	Disc-ploughed January.	Harrowed Mar., disc-cultivated May, sown with combine.	25 May ...	45	...
Gunnedah (H. Gardner).	Chocolate loam.	Disc-ploughed February.	Springtoothed Mar., sown with combine.	24 May ...	50	...
Boggabri (R. McKenzie).	Sandy loam.	Disc-ploughed February.	Springtoothed April, sown with combine.	9 May ...	50	...
Inverell (G. S. Makim).‡	Chocolate	Mouldboard ploughed February.	Harrowed Mar., springtoothed April, sown with combine.	12 May ...	58	...
Gunnedah (J. E. Peachey).	Chocolate	Disc-ploughed December.	Springtoothed Mar., sown with combine.	12 May ...	45	...
Wee Waa (J. Newnham).§	Sandy loam.	Disc-ploughed June.	Disced Dec., springtoothed Mar., sown with disc drill.	16 April ...	45	...
Inverell (E. Jeffery).	Black basaltic loam.	Mouldboard ploughed August.	Sown by hand and harrowed ...	3 August ..	50	...
Inverell (E. B. Finn).	Chocolate loam.	Disc-ploughed February.	Harrowed Mar., disc-cultivated April, sown with combine.	16 May ...	45	...
Bingara (G. L. Howson).‖	Chocolate loam.	Disc-ploughed February.	Springtoothed Mar. and April, sown with springtooth cultivator	25 April ...	45	...
Edgeroi (N. Barrett).	Chocolate loam.	Rigid scarified February.	Harrowed Mar., sown with combine.	21 April ...	45	...
Gunnedah (D. Perrett).¶	Chocolate loam.	Disc-ploughed March.	Springtoothed April, sown with combine.	20 May ...	48	...
Moree (J. McDonald).	Greyish belar loam.	Rigid scarified February.	Sown with combine	10 May ...	48	...
Narrabri (J. Houguet).	Greyish brigalow loam.	Disc-ploughed January.	Springtoothed Mar., sown with combine.	14 May ...	45	...
Inverell (McCosker Bros.).**	Red loam	Mouldboard ploughed February.	Springtoothed Mar., sown with combine.	15 April ...	45	...
Tambar Springs (J. Dyson).	Chocolate loam.	Disc-ploughed April.	Sown with combine	24 May ...	45	...
Boggabri (J. Penfold).	Chocolate loam.	Disc-ploughed January.	Springtoothed Mar., sown with combine.	17 April (early sown varieties), 10 May (others).	45	...
Bingara (C. Batterham).††	Chocolate loam.	Mouldboard ploughed April.	Sown with combine	23 April ...	45	...
Delungra (A. M. Paterson).	Black basaltic loam.	Mouldboard ploughed July.	Springtoothed Jan. and Mar., sown with combine.	29 April ...	45	...
Emerald Hill (F. Shaw).	Chocolate loam.	Rigid scarified December.	Harrowed Jan., springtoothed Feb., harrowed Mar., sown with combine.	24 May ...	43	...
Emerald Hill (L. Griffiths).	Medium loam.	Rigid scarified January.	Harrowed Mar., sown with combine.	12 May (early varieties), 6 April (others).	45	...
Tambar Springs (J. P. Weis).	Sandy loam.	Springtoothed January.	Springtoothed Mar., sown with combine.	15 May ...	45	...
Pallamallawa (S. Rigby).	Greyish loam.	Rigid scarified March.	Rigid scarified April, sown with combine.	12 May ...	45	...

* Plots rusted; Clarendon best sample. † Plots damaged by rust. ‡ Nabawa lodged. § Frosted in July. ‖ Frosted in July. ¶ Plots rolled mid-June. ** Hail damaged; early varieties affected most. †† Hail reduced yields. NOTE.—No superphosphate was used in any of the above trials.

CULTURAL Details and Yields of Wheat Variety

Varieties.	Curlewis (W. O. Manning).	Curlewis (F. McClintock).	Narrabri (W. McCutcheon).	Emerald Hill (E. S. Perrett).	Culgoora (S. Carberry).	Inverell (G. S. Thomas).	Boggabri (J. B. White).	Boggabri (C. Evans).	Boggabri (W. L. Laird).	Gunnedah (H. Gardner).	Boggabri (R. McKenzie).	Inverell (G. S. Makim).	Gunnedah (J. E. Peachey).	Wee Waa (J. Newnham).
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie	25 4	28 56	...	9 34	...	13 32	...	...	...	23 57	7 20	...	...	24 42
Baringa	...	...	...	...	36 20	...	35 23	...	...	26 15	...	...	...	...
Bena	...	...	...	...	...	...	...	13 14	...	...	...	...	...	...
Burrill	...	...	35 9	...	38 32	...	31 40	...	...	24 52	...	...	...	...
Cadia	...	...	...	...	...	...	...	...	...	...	...	37 30	...	...
Canberra	...	...	29 18	...	...	...	...	...	...	...	...	...	...	...
Canimbla	...	...	...	...	...	...	39 15	...	...	...	...	46 58	...	...
Carrabin	...	...	...	...	27 18	...	...	...	...	...	...	...	...	...
Clarendon	...	...	21 15	10 2	...	21 15	...	...	...	...	...	...	...	...
Cleveland	...	...	...	...	...	...	...	...	...	...	...	37 30	...	...
Currawa	...	31 0	...	...	...	...	36 45	...	...	...	...	37 39	...	...
Dan	...	...	...	...	31 40	...	...	...	...	...	...	...	...	...
Dundee	18 46	...	...	...	28 2	...	27 49	16 10	27 48	27 48	...	...	24 24	23 56
Duri	...	26 30	...	...	...	...	31 54	...	3 28	25 56	9 42	...	21 26	16 38
Early Bird	21 44	26 19	...	...	...	...	29 55	8 37	...	...	6 30	...	...	...
Florence	...	...	...	...	18 41	...	...	...	...	...	...	...	...	...
Ford	26 7	31 0	30 21	15 41	45 30	...	29 13	17 14	8 6	29 40	6 40	...	24 34	28 0
Garra	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Geeralying...	...	26 27	...	11 3	16 40	21 43	21 5	...	...	24 35	8 30	...	...	16 42
Girral	...	...	29 36	...	...	...	...	...	...	...	...	...	...	...
Gluyas Early	20 45	27 36	...	...	...	...	29 58	...	...	...	...	...	...	17 11
Gluford	...	...	...	...	48 58	...	...	...	...	...	...	...	...	...
Gresley	...	...	...	...	...	...	...	...	5 13	...	...	...	...	...
Gular	...	...	28 35	...	19 58	...	20 53	...	...	25 31	...	...	...	23 51
Hard Federation	...	...	...	...	...	...	...	13 50	5 55	...	7 20	...	...	...
Lawson	...	19 25	...	...	35 33	...	32 8	...	...	23 51	...	...	26 48	...
Nabawa	25 37	32 14	30 55	13 50	30 39	...	35 38	11 52	4 10	25 18	6 40	29 53	24 34	22 57
Pusa No. 4	16 58	21 33	...	...	26 9	...	23 36	12 4	...	...	...	...	17 39	12 41
Queen Fan	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ranee	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sword	...	...	...	...	41 40	...	...	...	...	...	...	...	...	...
Waratah	20 50	29 5	28 5	9 8	34 24	16 17	28 42	15 15	5 28	21 15	5 25	...	25 15	19 35

Trials, North-western District, 1932–33—*continued.*

Inverell (E. Jeffery).	Inverell (E. B. Finn).	Bingara (G. L. Howson).	Edgeroi (N. Barrett).	Gunnedah (D. Perrett).	Moree (J. McDonald).	Narrabri (J. Houguet).	Inverell (Mc Cosker Bros.).	Tambar Springs (J. Dyson).	Boggabri (J. Penfold).	Bingara (C. Batterham).	Delungra (A. M. Paterson).	Emerald Hill (F. Shaw).	Emerald Hill (L. Griffiths).	Tambar Springs (J. P. Weis).	Pallamallawa (S. Rigby).
bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
...	...	...	30 0	...	...	6 20	13 9	10 0	...	18 32	...	...	21 13	34 10	...
...	...	...	...	...	...	...	...	...	...	...	38 29	...	...	...	...
...	...	...	...	3 20	...	...	...	...	...	...	...	...	...	...	...
...	23 5	...	...	...	5 50	...	...	...	29 58	...	32 46	13 46	...	...	29 9
...	17 12	...	...	...	...	...	15 0	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15 45	21 22	...	...	...	...	...	22 4	...	28 58	...	40 57	...	...	...	30 52
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16 30	...	...	...	...	...	6 7	11 11	7 0	...	15 12	...	...	12 7	25 58	...
12 0	16 56	...	...	...	...	...	17 36	...	...	...	...	...	...	...	...
9 0	21 2	...	...	...	...	...	18 39	...	26 24	...	36 6	...	...	...	24 11
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	20 7	22 30	...	11 6	4 35	6 44	...	...	21 48	...	...	12 23	15 9	...	23 24
...	...	...	49 48	...	...	6 15	12 34	...	30 5	...	31 0	...	13 38	39 18	...
...	...	...	...	...	3 0	...	...	12 0	...	...	...	...	12 7	28 42	23 41
...	...	...	30 0	...	...	...	...	...	...	...	...	...	...	...	...
16 30	20 25	16 40	31 41	10 0	4 0	6 53	16 6	14 0	28 2	23 52	40 45	13 40	16 40	31 26	32 43
...	...	...	...	...	...	...	...	...	...	23 5	...	...	...	...	...
...	15 38	26 2	44 56	8 53	3 10	6 0	13 20	10 0	20 57	10 0	30 9	10 56	13 38	25 52	25 24
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	7 46	...	5 55	...	...	...	...	...	...	...	...	...
...	...	...	45 0	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	17 51	23 0	3 20	...	6 10	...	...	22 24	...	...	...	...	...	...
...	...	...	49 16	...	...	7 21	...	...	...	18 48	...	...	...	...	...
15 0	15 39	20 28	...	...	...	...	...	...	24 54	...	...	...	15 9	...	22 36
...	19 1	18 20	39 21	5 53	7 35	7 10	15 22	10 0	23 36	17 42	32 18	11 24	18 12	36 13	24 16
...	...	21 40	25 0	...	3 10	...	...	...	...	...	...	...	...	...	18 16
...	15 44	...	...	...	...	...	13 38	...	...	...	24 7	...	...	...	...
...	...	...	...	...	...	...	...	7 0	...	...	...	...	...	...	...
...	...	...	36 0	...	...	...	...	...	...	...	...	...	...	...	...
10 30	21 58	25 0	29 7	7 46	5 0	7 3	14 9	14 0	28 54	15 6	28 8	7 2	...	27 20	16 30

Foot Rot and Rust Caused Damage.

At Inverell foot-rot was by far the most prevalent disease and all varieties were affected. At Gum Flat in the same district one trial was a failure as a result of the disease. Rust was also responsible for damage to susceptible varieties at Inverell, being particularly severe in the earlier section of the district. It caused damage in those trials which had made a good recovery after the dry spell in June, July and August, the second growth producing shrivelled seed.

A heavy infestation of flag smut was anticipated in view of comparatively dry conditions prior to seeding and in the early stages of growth, but the infection, even in susceptible varieties, was comparatively light.

Fertiliser not Generally Recommended.

The fertiliser trials this season again confirmed the results of previous years, which indicate that the use of superphosphate on the wheat soils of the north-west cannot generally be recommended. The trials this year were carried out on the farms of Messrs. J. C. Wood, "Greenwood," Curlewis; D. Lillybridge, Narrabri West; and L. J. Griffith, "Ballendene," Emerald Hill.

YIELDS in the Wheat Fertiliser Trials.

——	Curlewis.	Narrabri West.	Emerald Hill.
Soil ...	Chocolate Loam.	Red Sandy Loam.	Medium to Sandy Loam.
	bus. lb.	bus. lb.	bus. lb.
Superphosphate per acre 112 lb. ...	....	....	18 0
" " " 70 lb. ...	....	10 0	....
" " " 51 lb. ...	....	....	18 0
" " " 50 lb. ...	....	10 0	....
" " " 40 lb. ...	17 49	....	....
" " " 31 lb. ...	....	....	18 0
" " " 35 lb. ...	....	10 0	....
No manure	16 57	10 0	18 0

NOTE.—Nabawa was the variety used in all the trials.

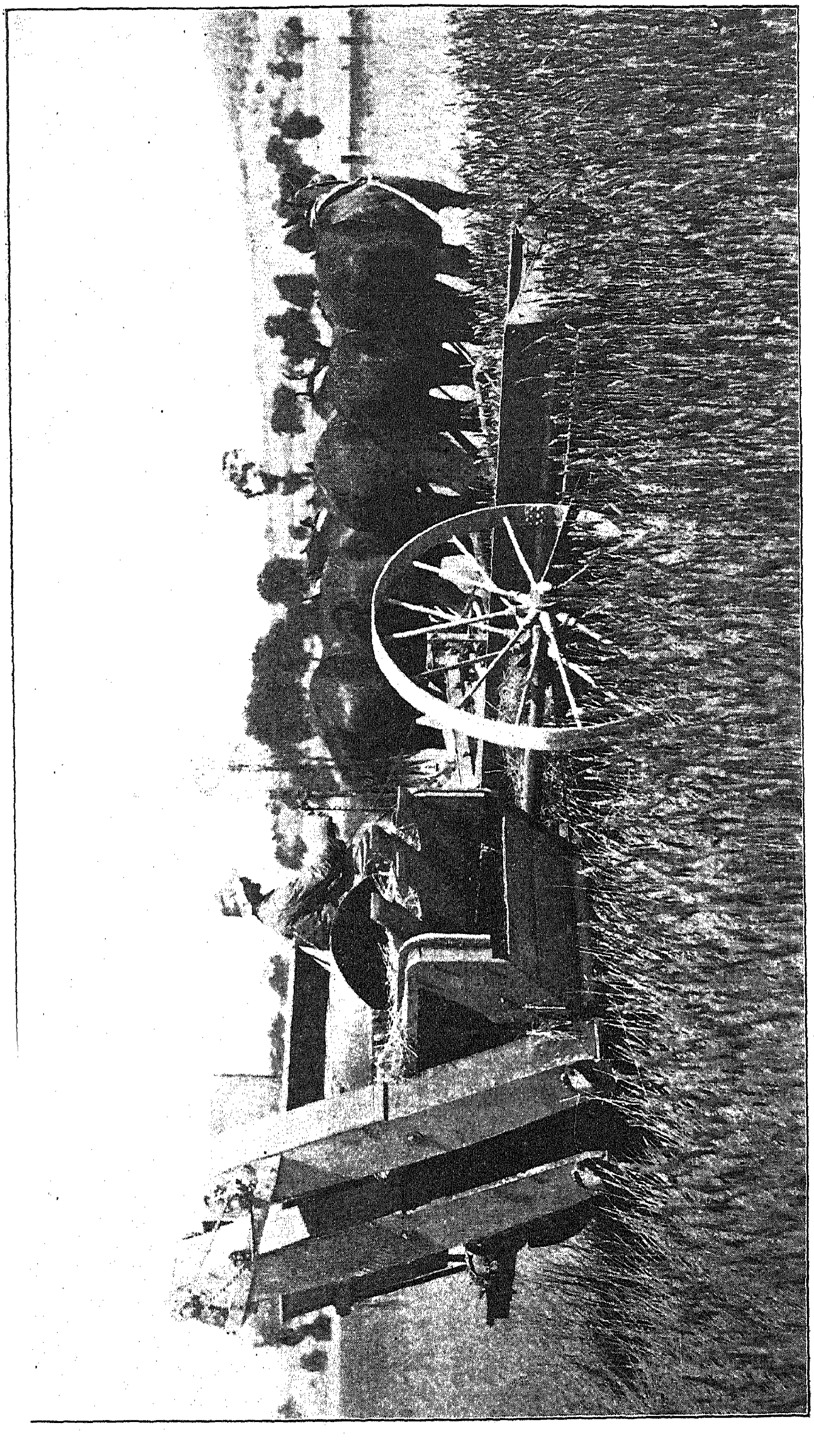
It is interesting to note in the case of the Curlewis trial that although the soil used had grown twenty-four previous wheat crops the increased yield due to the use of superphosphate was almost negligible.

The Older Varieties of Oats do Well.

The yields from oats were not high this season owing to dry conditions, but the results of the trials demonstrated the ability of oats to recover after late feeding and to respond to rains even late in the season. Some of the trials were fed till the middle of August and the varieties responded well after the September rains.

The older varieties generally yielded well whilst the new ones, such as Kendall, Burke, Palestine and Laggan, behaved satisfactorily and are well worthy of further trial.

Detailed results of the oat variety trials are shown in the accompanying table.



The Reaper-thresher at Work.

CULTURAL Details and Yields of Oat Variety Trials, North-western District, 1932–33.

District.	Bingara.	Mt. Russell.	Tambar Springs.	Narrabri.	Boggabri.	Gunnedah.	Curlewis.	Boggabri.
Experimenter.	G. L. Howson.	F. Mills.	J. Dyson.	R. Richards.	J. Penfold.	M. Worboys.	J. Cavanagh.	R. McKenzie.
Nature of soil	Chocolate loam.	Chocolate loam.	Chocolate loam.	Greyish loam.	Chocolate loam.	Sandy loam.	Chocolate loam.	Chocolate loam.
Ploughing	Disc ploughed, February.	Mouldboard ploughed, April.	Disc ploughed, April.	Springtoothed, February.	Mouldboard ploughed, January.	Disc ploughed, February.	Rigid scarified, January and March.	Disc ploughed, February.
Cultivation	Disc ploughed May, sown with springtooth cultivator.	Springtoothed June, sown with disc drill.	Sown with combine.	Sown with combine.	Springtoothed March, sown with combine.	Springtoothed February, sown with combine.	Sown with combine.	Harrowed April, sown with combine.
Date of sowing	25 May	2 June ...	27 April ...	4 April ...	17 April ...	23 May	28 April ...	19 May.
Seed per acre	40 lb.	45 lb.	45 lb.	40 lb.	40 lb.	40 lb.	40 lb.	50 lb.
Superphosphate per acre	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
After treatment ...	Fed off	....	....	Fed off	....	....	....	....
Remarks	....	....	....	....	....	....	Fed off	Fed off.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	....	56 31	27 0	22 20	25 16	....	47 28	16 20
Belar	....	....	13 0	24 0	24 30	....	....	15 20
Buddah	24 0	....	....	13 34	19 20	24 0	....	....
Burke	24 0	27 29	....	18 18	18 21	....	37 20	....
Gidgee	....	....	....	....	....	22 20	36 24	....
Guyra	....	20 21	21 39	....	....	27 0	46 39	15 10
Kendall	18 0	35 19	....	....	....	....	....	....
Lachlan	....	....	25 0	....	....	....	....	....
Laggan	....	28 20	....	....	....	15 0	....	7 20
Mulga	18 0	22 21	18 30	8 7	13 35	21 13	42 2	15 0
Palestine	....	....	21 35	13 34	9 28	23 13	43 9	7 12

Trials in the Temora District.*

Variety and fertiliser trials with both wheat and oats were again carried out in the Temora district this season under excellent seasonal conditions. The rains, although light, were frequent and opportune, and even though the absence of soaking rains in the winter at first caused some anxiety, there was really no need for alarm, and generally speaking the season was one of the best experienced for many years. The cool weather which prevailed during the latter part of the spring and early summer months proved an advantage, as it prolonged ripening, an important factor, considering the limited supply of moisture in the soil.

RAINFALL Registrations, 1931–32.

	Eurongilly.	Marinna.	Marrar.	Rannock.	Junee Reefs.	Dirnaseer.	Yannawah.	Bribbaree.	Thuddungra.	Young.	Kingsvale.	Burrowa.	Cunningar.	Reefton.	Muttama.	Galong.
							Rainfall on Fallow.									
1931.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
March ...	...	...	...	...	...	355	...	...	...	...	...	...	...	...	...	...
April ...	...	...	...	...	...	334	...	...	...	...	...	...	...	...	...	...
May	...	...	...	...	...	644	...	...	...	...	...	...	...	...	...	...
June	...	...	...	...	...	640	...	...	...	...	...	...	600	...	...	...
July	112	...	88	74	...	189	...	...	199	...	...	...	90	...	...	...
August ...	90	...	91	111	86	104	132	134	54	127	...	...	223	42	...	...
September ...	285	...	100	93	165	112	141	111	135	96	187	71	210	79	...	...
October ...	49	55	54	59	34	16	90	53	71	65	13	53	67	26	...	...
November ...	201	150	68	179	163	173	180	168	151	112	246	118	202	91	...	...
December ...	13	33	10	...	16	53	163	230	216	223	128	127	...	51	...	...
1932.																
January ...	...	...	3	...	9	57	...	...	...	...	...	...	22	...	...	...
February ...	43	75	47	82	101	...	5	46	66	35	70	146	182	35	...	...
March ...	461	359	302	197	333	214	260	268	197	238	269	298	380	318	...	...
Total on Fallow ...	1,254	672	763	795	907	2,891	972	1,010	1,089	896	913	813	1,976	642	...	...
							Rainfall on the Growing Crop.									
1932.																
April ...	298	275	287	254	260	310	464	344	306	199	226	260	242	319	402	262
May	71	64	54	46	54	141	48	103	77	71	52	45	68	90	90	36
June	198	197	196	77	242	120	162	110	171	134	213	167	285	53	201	213
July	154	167	141	94	186	194	201	167	173	134	158	228	179	162	273	177
August ...	262	244	321	222	264	252	164	152	172	64	213	242	282	194	299	227
September ...	107	84	137	144	168	132	136	141	108	225	87	184	206	107	102	85
October ...	105	100	134	36	134	74	17	46	30	107	13	40	53	24	10	48
November ...	216	138	79	41	166	109	165	184	314	292	294	332	115	92	216	218
Total on crop	1,411	1,269	1,349	914	1,474	1,332	1,357	1,247	1,351	1,226	1,256	1,498	1,430	1,041	1,593	1,266

Will Bobin Replace Waratah?

The grain harvested at all centres was of good to excellent quality, except for slight bleaching due to showers received on plots where stripping had been delayed.

Bobin materially enhanced its reputation by showing a vastly increased yield over Waratah at practically all centres. Possibly the season may have been well suited to this variety, but even allowing for that factor there is a strong possibility that it will replace Waratah, particularly in the dryer parts of the district. In the better favoured districts it displayed a weakness in the straw.

* The trials in this district were conducted by Mr. L. Judd, Manager, Temora Experiment, and District Instructor, whose report is summarised under the above heading.

Ford yielded well up to expectations in most centres, but in some cases the yield suffered through inability to recover all the grain with a harvester where the crop had lodged badly. Its weak straw is a decided disadvantage, but it has the ability to comb out nicely at harvest. This variety demands further trial at all centres and gives promise of greater popularity in the near future.

Dundee gave excellent yields at most centres and for a new introduction has attained marked popularity. With its many good qualities it promises to fill an important position among mid-season varieties. It is certainly deserving of trial right throughout the district, as it undoubtedly possesses marked adaptability to both climatic and soil conditions.

The season again proved unsatisfactory for Nabawa and right throughout the district its performance was disappointing. A warning is issued against premature discarding of this variety on its poor showing this year. There is a strong tendency to discard this variety in a number of centres, but hasty action will quite possibly be followed by regrets, particularly should a season of meagre rainfall follow, when drought-resistant varieties will prove a valuable standby.

Free Gallipoli again gave good average yields throughout the district. It is a variety which should be sown on land in good heart and where an oat rotation and good fallow are practised with a view of combating disease. The liability of this variety to flag smut is unfortunate in view of its drought resistance, strong straw and ability to hold its grain.

Baringa yielded well at all centres, but the difficulty of thrashing it will militate against extensive cultivation.

Yandilla King, generally speaking, did not yield as well as usual. The dry spell experienced in the spring caught this variety at a critical stage, which undoubtedly materially affected its yielding abilities.

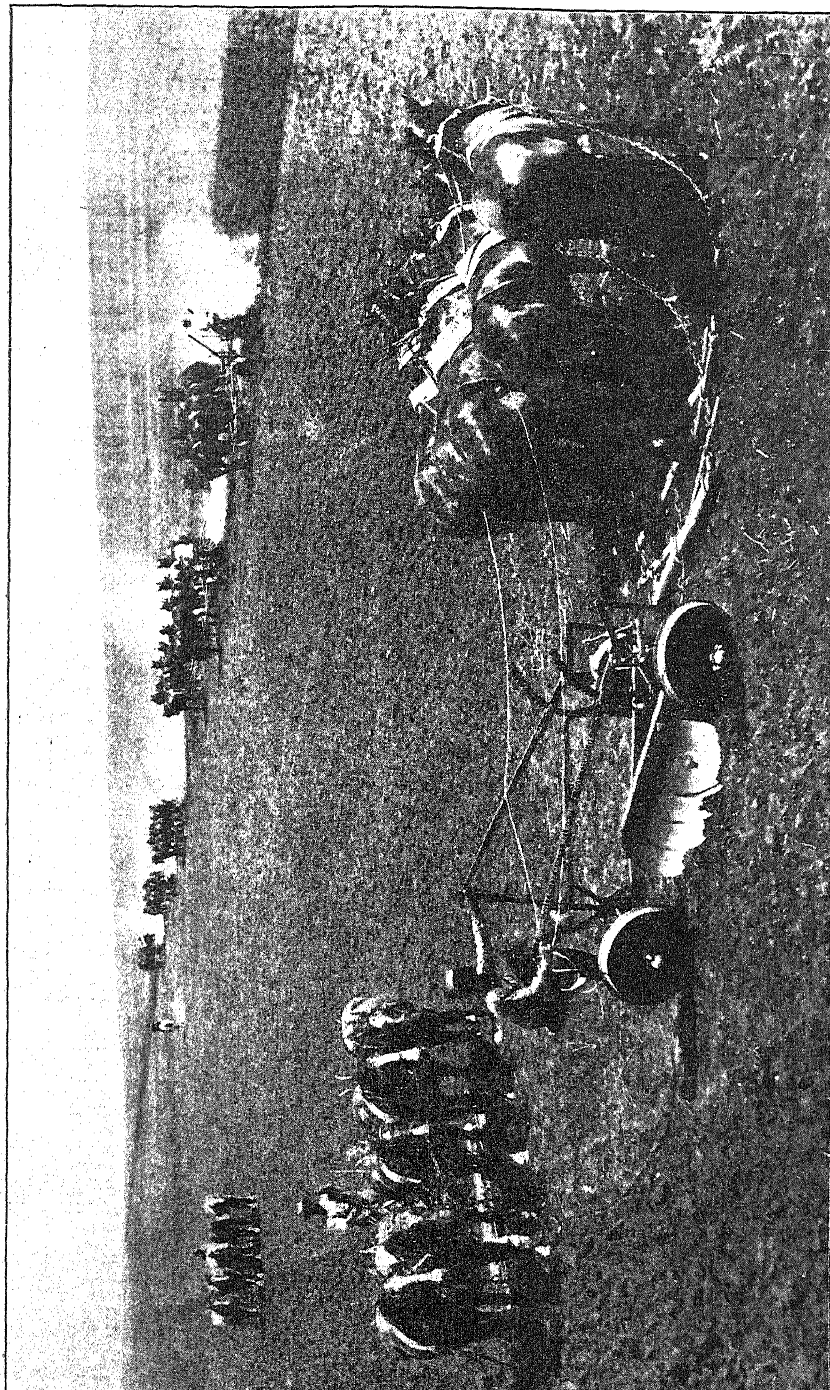
YIELDS in the Wheat Fertiliser Trials.

Fertiliser per acre.	Eurongilly (Brabbin Bros.).	Junee (H. West).	Dirnaseer (D. Adamson).	Marrar (J. W. Stevenson).	Rannock (A. G. Lange).	Reefton (H. Nixon).	Yannawah (H. Smithers).	Young (T. C. West).	Young (H. Thackeray).	Muttama (H. Rumble).	Cunningar (B. J. Stocks).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
112 lb. ...	11 10	32 16	44 29	30 0	29 3	24 25	36 1	29 19	38 7	18 40	26 11
84 lb. ...	15 7	33 55	44 6	30 6	29 20	24 15	30 10	26 24	36 26	17 54	29 58
56 lb. ...	16 28	30 10	40 6	29 28	28 30	23 20	27 7	25 29	33 5	16 43	29 6

NOTE.—A trial was also conducted at Galong by Mr. L. Sargent, the yields being: 56 lb. superphosphate, 43 bus. 50 lb.; 40 lb. superphosphate, 46 bus. 28 lb.; no manure, 43 bus. 39 lb. Yandilla King was used at all centres except Young (T. C. West) and Galong, where Waratah was sown.

Wheat Diseases.

Rust made its appearance at Young, Burrowa, Harden, Galong and Kingsvale, but fortunately windy and cold weather together with a total absence of humid conditions prevented heavy losses. It is interesting to note that Canimbla showed rather more severe infection than even Yandilla King.



The Harvest Over, Ploughing Time Will Soon be Round Again.

CULTURAL Details and Yields of Wheat Variety Trials, Temora District, 1932–33.

District	Euron-gilly.	Marinna.	Junee.	Dirnaseer.	Marrar.	Rannock.	Reefton.	Yannawah.
Experimenter ...	Brabbin Bros.	E. Edwards.	H. West.	D. Adamson.	J. W. Stevenson.	A. G. Lange.	H. Nixon.	H. Smithers.
Nature of soil ...	Red loam	Red loam	Red and grey loam.	Heavy red loam.	Granite loam.	Red loam	Heavy clay loam.	Heavy red loam.
Ploughing ...	Mouldboard 4 inches July.	Mouldboard 4½ inches October.	Mouldboard 4 inches May.	Disced March.	Mouldboard 5 inches July.	Mouldboard 4 to 4½ inches July.	Mouldboard 4 inches August.	Mouldboard 4 inches August.
Cultivation ...	Disc-cultivated February, spring-toothed March and April, sown with drill.	Harrowed end October, spring-toothed November, harrowed January, spring-toothed April, harrowed April, sown with disc drill.	Harrowed June, disced October and February, harrowed March, sown with combine.	Harrowed September, spring-toothed November, harrowed April, sown with combine.	Spring-toothed November, harrowed March, spring-toothed April, sown with combine.	Spring-toothed March, and April, sown with drill.	Spring-toothed September and February, March and April, sown with combine.	Harrowed October, sunder cut February, scarified March and April, harrowed April, sown with combine.
Date of sowing ...	8 April & 28 May.	8, 9, & 30 April.	16 & 30 April.	26 April & 30 May.	15 April & 9 May.	22 April	18 May	26 April & 28 May.
Seed per acre ...	60 lb.	60 lb.	60 lb.	70 lb.	63 lb.	60 lb.	65 lb.	65 lb.
Superphosphate per acre.	84 lb.	84 lb.	84 lb.	84 lb.	84 lb.	56 lb.	56 lb.	84 lb.
After treatment ...	Nil.	Nil.	Nil.	Nil.	Harrowed	Nil.	Nil.	Nil.
Remarks	Yield affected by black oats.	Crop fed-back.	Surface crusted due to heavy rain.	Nabawa and Ford lodged badly, Penny shed badly and Dundee, Bobin and Waratah slightly.	Ford, Waratah, Nabawa and Bobin lodged.	Waratah and Bobin lodged, Yandilla King shed.	......	Ford and Duchess slightly frosted.
Varieties. Late and Mid-season.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Yandilla King (Standard).	15 7	......	33 55	44 6	30 6	28 30	23 20	30 10
Marshall's No. 3	......	......	......	40 47	......	......	......	30 44
Duchess ...	......	......	......	......	......	......	......	......
Sepoy	......	......	......	......	33 32	28 50	......	......
Canimbla ...	......	......	......	......	......	......	......	......
Ford	7 42	30 45	33 50	44 1	25 29	......	22 21	34 55
Free Gallipoli ...	21 40	23 1	32 48	43 24	33 57	......	25 7	36 1
Bena	19 35	23 40	31 58	......	28 21	......	......	32 46
Bredbo ...	......	......	......	......	......	......	......	......
Penny	18 20	22 5	......	32 31	......	26 57	......	......
Nabawa ...	20 8	25 32	34 46	34 24	24 41	26 59	21 46	27 50
Dundee ...	19 17	26 4	36 10	45 38	35 21	......	25 24	38 37
Rajah	......	......	......	......	......	......	......	......
Ranee	......	......	......	......	......	......	......	......
Baringa ...	27 52	26 32	......	......	37 38	28 1	22 13	34 7
Union	......	......	......	......	......	26 41	......	......
Early Maturers—								
Waratah (Standard).	10 58	28 11	35 47	33 39	28 13	31 4	21 40	27 21
Bobin	13 14	32 6	45 45	39 46	37 32	34 2	25 54	29 35
Duri	......	......	......	......	......	......	......	32 42

CULTURAL Details and Yields of Wheat Variety Trials, Temora District, 1932–33—*continued.*

District	Young.	Thuddungra.	Young.	Kingsvale.	Muttama.	Galong.	Cunningar.
Experimenter ...	T. C. West.	C. Ballard.	R. H. Thackeray.	G. Coddington.	H. Rumble.	L. Sargent.	B. J. Stocks.
Nature of soil ...	Heavy clay loam.	Basaltic loam.	Light loam .	Light loam.	Light loam.	Red and grey loam.	Light red loam.
Ploughing ...	Mouldboard 3 inches August.	Mouldboard 4 inches July.	Mouldboard 4½ inches August.	Mouldboard 4 inches September.	Mouldboard 4½ inches March.	Mouldboard 5 inches August.	Mouldboard 5 inches June.
Cultivation ...	Spring-toothed February and April, sown with combine.	Harrowed September, spring-toothed September, harrowed November, spring-toothed March, sown with combine.	Harrowed October, spring-toothed November, harrowed December, scarified January, sown with combine.	Spring-toothed February, and mid-April, sown with combine.	Harrowed March, sown with combine.	Spring-toothed March, disced April, spring-toothed May, sown with combine.	Scarified September and November, and before sowing.
Date of sowing ...	28 April & 17 May.	29 April & 28 May.	2 May ...	29 April ...	14 & 15 April.	10 & 11 May.	5 & 6 May
Seed per acre ...	60 lb.	60 lb.	65 lb.	65 lb.	70 lb.	60 lb.	65 lb.
Superphosphate per acre.	56 lb.	84 lb.	84 lb.	84 lb.	84 lb.	56 lb.	56 lb.
After treatment ...	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks	......	Ford and Nabawa lodged.	......	Fed off. Heads of Marshall's No. 3 and Yandilla King broken off.	Fed off ...	Aussie and Waratah lodged badly.	......
Varieties.							
Late and Mid-season—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Yandilla King (Standard).	25 15	39 36	36 26	21 0	17 54	......	29 6
Marshall's No. 3..	......	36 6	......	26 20	19 17	......	27 16
Duchess ...	25 35	......	......	......	......	......	......
Sepoy	......	......	......	......	......	......	......
Canimbla ...	......	......	33 20	33 10	19 35	......	29 31
Ford	30 0	35 6	36 52	28 10	22 17	49 42	32 10
Free Gallipoli ...	28 22	40 40	36 42	30 58	......	45 35	23 46
Bena	......	......	35 51	......	19 19	......	......
Bredbo	......	......	......	31 18	......	45 16	......
Penny	......	......	......	......	......	......	......
Nabawa ...	23 46	36 10	......	......	17 1	......	22 18
Dundee ...	30 37	43 23	38 4	38 1	17 7	......	24 30
Rajah	......	......	......	......	......	48 15	......
Ranee	......	......	......	......	......	41 2	......
Baringa ...	31 13	......	......	......	......	......	......
Union	......	......	......	......	......	......	......
Early Maturers—							
Waratah (Standard).	25 29	40 0	36 53	27 30	19 12	43 50	22 3
Bobin	28 40	44 30	41 21	32 37	......	50 0	26 35
Duri	25 47	......	......	......	......	......	......

Flag smut was in evidence right throughout the plots, but to a less degree than last year. Loose smut was present, Bobin showing infection in excess of most others. This disease seems to be gaining in severity each year.

Foot-rot occurred in most centres, being particularly noticeable at Burrowa. This disease also seems to register a yearly increase.

Belar the Best Dual-purpose Oat.

Oat varieties were under trial at six centres, and the results are shown in detail in the accompanying table.

Belar can safely be classed as the most popular dual-purpose variety in the Temora district. Its good hay qualities, coupled with its strength of straw and grain yielding ability, must secure for it a prominent place in oat cropping.

Gidgee is a promising early-maturing variety. It cures an excellent sample of hay, with a wonderful colour. Its earliness of maturity makes it particularly suitable for cropping down headlands for hay, where it can be cut, matured, and carted well before the grain harvest. It can well replace Mulga right throughout the district as an early-maturing oat. Its increased strength of straw alone warrants its cultivation in place of Mulga.

Algerian, as a grain-producing oat, must still rank as the most popular variety for this purpose, particularly around the Junee district, where regular supplies are required of this variety in the sheaf for the straw envelope factory, Algerian straw holding pride of place for this purpose.

CULTURAL Details and Yields of Oat Variety Trials, Temora District, 1932–33.

District ... ... Experimenter ...	Eurongilly. S. Cooper.	Marinna. E. Edwards.	Coolamon. T. E. Lewis.	Bribbaree. N. Carr.	Thuddungra. D. Watson.	Muttama. S. Moore.
Nature of soil ...	Gravelly red loam.	Light loam...	Red loam ...	Red loam ...	Red loam ...	Grey loam.
Ploughing	Sundercut 3 inches, March.	Mouldboard 4 inches, September.	Sundercut 3½ inches, September.	Scarified 3½ to 4 inches, June.	Mouldboard 4 inches, August.	Mouldboard 5 inches, April.
Cultivation	Harrowed April, sown with combine.	Harrowed October, spring-toothed November, harrowed January, spring-toothed, March.	Sundercut February, sown with combine.	Ploughed August, 3½ to 4 inches, scarified March, sown with combine.	Scarified November, & April, sown with combine.	Harrowed April, sown with combine.
Date of sowing ...	25 April.	25 March.	23 & 24 March.	21 & 22 April.	30 April.	3rd May.
Seed per acre ...	60 lb.	70 lb.	65 lb.	50 lb.	60 lb.	46 lb.
Superphosphate per acre	56 lb.	56 lb.	56 lb.	56 lb.	56 lb.	56 lb.
After treatment ...	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks	Crops lodged and shed; Palestine least loss.	Fed back April and June.	Fed back. All plots shed heavily.	Fed off July. Cape weed bad. Palestine lighter seeding.	......	Fed off. Mulga down and tangled.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
*Algerian (Standard)	42 0	35 11	15 38	51 10	48 18	......
*Belar	39 14	39 10	16 1	44 12	53 22	53 14
†Buddah	28 30	......	......	......	......	......
†Gidgee	38 0	33 8	13 6	37 1	35 12	67 1
†Mulga	37 17	27 15	16 24	32 20	28 11	35 24
*Palestine	44 25	......	......	33 14	......	......
*Guyra	......	33 0	17 24	......	56 26	61 24

* Midseason and late maturers. † Early maturers.

YIELDS in Oat Fertiliser Trials.

Superphosphate per acre.	Eurongilly (Belar Variety).		Marinna (Belar Variety).		Coolamon (Mulga Variety).		Bribbaree (Mulga Variety).	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
56 lb.	39	14	39	10	16	24	32	20
84 lb.	46	30	40	0	11	26	37	14
No manure	40	11	43	14	8	15	24	27

Heavy Yields in the Western District (Dubbo Centre).*

During the 1932 wheat season, farmers co-operated with the Department in carrying out wheat and oat trials at Eurimbla, Wellington, Wongarbon, Nubingerie, Toongi, Dubbo, Rawsonville (Dubbo), Eumungerie, Balladoran, Gilgandra, Armatree, Coonamble, Narromine, Mungeribar, and Wyanga.

The Season.

Detailed comment on the weather conditions during the wheat season in this district are given on page 204 in connection with the wheat crop-growing competitions. The rainfall registrations at the various centres where farmers' experiment plots were conducted are given in the following table :—

RAINFALL Records.

	Eurimbla.	Wellington.	Wongarbon.	Nubingerie.	Toongi.	Dubbo. (H.J. Harvey.)	Dubbo. (G. R. Lee.)	Eumungerie.	Balladoran.	Gilgandra.	Armatree.	Narromine.	Mungeribar.	Wyanga.
	Rainfall on Fallow.													
1931.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
March	...	...	...	...	...	...	...	...	...	626	...	...	...	...
April	...	...	...	...	...	...	...	...	...	360	...	...	...	...
May	...	...	...	...	...	...	...	...	...	483	...	...	...	...
June	...	...	...	336	...	...	...	...	...	370	...	...	...	...
July	...	...	...	128	...	...	...	...	...	124	...	...	...	...
August	...	...	...	24	...	35	22	...	34	16	...	...	...	21
September ...	163	112	73	80	...	60	51	41	46	99	50	60	...	97
October	50	72	47	52	...	38	32	27	24	20	65	37	...	36
November ...	141	223	143	180	...	127	143	132	158	31	229	91	...	148
December... ...	400	387	347	556	...	289	248	304	405	387	438	227	...	249
1932.														
January	30	14	32	...	38	31	44	...	15	21	36	10	29	4
February	60	168	165	101	82	56	18	152	73	105	20	85	54	37
March	537	425	367	457	360	279	257	228	254	264	303	321	315	251
Total on Fallow ...	1,381	1,401	1,174	1,914	480	915	815	884	1,009	2,906	1,141	831	398	843
	Rainfall on Growing Crop.													
1932.														
April	227	175	241	138	220	209	118	99	126	97	111	106	152	152
May	17	30	26	20	20	30	28	35	46	41	36	25	31	18
June	123	81	83	64	80	106	80	43	69	79	72	75	91	82
July	180	110	101	87	75	95	64	78	136	114	215	95	87	92
August	192	157	99	99	110	96	44	76	103	85	80	175	122	117
September ...	293	408	237	267	391	498	482	449	339	314	210	349	391	374
October	132	44	39	43	25	31	33	17	101	82	52	29	47	160
Total on Crop	1,164	1,005	826	718	921	1,065	849	797	920	812	776	854	921	995

* The particulars under this heading are from the report of Mr. B. M. Arthur, Senior Agricultural Instructor for the district, who conducted the trials.

As the result of substantial rainfall, ranging from $2\frac{1}{2}$ to 5 inches, recorded generally over the whole district in September, nearly all crops recovered remarkably, and filled out well, and some of the highest yields ever recorded in experiment plots in this section of the western district in both wheat and oats were harvested. With one or two exceptions, the general average of all variety plots was exceptionally good, when the crops were sown on well-prepared seed-beds.

Yields of Over 50 Bushels Per Acre.

Varieties which showed out prominently in these trials were Nabawa, Ford, Dundee, Rajah, Bobin, Baringa, Burrill and Gullen. Fifty-three individual plots of all varieties exceeded 30 bushels per acre, thirteen were over 40 bushels, and two over 50 bushels per acre.

Nabawa, used as a standard variety in all trials topped the yields at five centres, and was well represented at the others. It is undoubtedly the most popular variety now grown, and deservedly so on account, of its known resistance to dry weather conditions, flag smut, and rust. Its only faults are weakness of straw, and a tendency to bleach readily.

Ford also did remarkably well in all trials, and will next season rival Nabawa in popularity, as plentiful supplies of seed are now available. It is a South Australian tall-strawed, white-eared, variety of mid-season to late maturing habits, resistant to rust, and reasonably so to flag smut. On account of its tallness of straw, it tended to lodge at times, but the straw is tough and combs up well, presenting no difficulties in harvesting.

Dundee is a midseason variety of high yielding capabilities, resistant to flag smut, but liable to rust. It has straw of medium length and strength, prolific brown ears, grain of good appearance and quality, and is likely to become popular when seed is available.

Rajah, a Victorian midseason crossbred, has undoubted high yielding characteristics if conditions are suitable for its optimum growth. It resists both rust and flag smut reasonably well, and has a white, square prolific ear, and rather tall straw.

Bobin again demonstrated its exceptional drought resistance, and high yielding qualities provided stem rust does not appear. It is very liable to rust, and that is undoubtedly the chief objection to this variety. Flag smut is resisted moderately well.

Baringa, an early maturing variety of good appearance, showed its capacity for yielding. It has the reputation of being tough to strip, but so far that disadvantage is not born out by experience in this part of the West.

Burrill is a late maturing, tall-strawed, white-eared variety of attractive appearance, which appears to be of distinct promise.

Gullen is a very early-maturing, brown-eared variety with attractive grain, and good yielding capabilities.

Other varieties to yield well were Aussie, Bald Early, Bena, Free Gallipoli, Gresley, Penny, Riverina, Turvey and Waratah.

Geeralying also gave good results, but showed a distinct tendency to shell badly at all centres, which habit has not been noticed previously in this variety, and it may be that it is only a seasonal occurrence.

Varieties which yielded disappointingly this season were Baroota Wonder, Barwang, Carinda, Sepoy and Currawa. After two or three year's trial, some of these varieties will now be discontinued in these tests.

The yields of the varieties at all centres are given in the table on pages 178 and 179. In addition to those shown in the table the following varieties were tried at Coonamble on the farm of Mr. H. A. White, the yields being as shown :—

Variety.	Yield. bus. lb.
Early Bird (sown 30th May)	19 30
Clarendon (sown 4th June)	16 45
Florence (sown 26th May)	16 0
Geeralying (sown 28th May)	21 45

Fertiliser Trials with Wheat.

As has been the practice for some years past a wheat manurial trial was conducted at each centre with the standard variety (Nabawa), unmanured plots being compared with the manured plots of Nabawa, which received applications of from 50 lb. to 64 lb.—the majority 56 lb.—at the various centres. The objective was to demonstrate the advantage of superphosphate in the obtaining of increased yields, rather than to try and ascertain the best quantities to use for different types of soils, and localities. The results showed substantial increases of from 1 to 11 bushels at most centres; at two centres seasonal influences were probably responsible for negative results.

RESULTS of Fertiliser Trials (variety Nabawa).

Super-phosphate Per Acre.	Eurimbla.	Wellington.	Wongarbon.	Nubingerie.	Toongi.	Dubbo (H. J. Harvey).	Dubbo (G. R. Lee).	Eumungerie.	Balladoran.	Gilgandra.	Armatree.	Narromine.	Mungeribar.	Wyanga.	Dubbo (H. Harvey) Bobin Wheat.	Coonamble (H. A. White) Gullen Wheat.
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.
50 lb. ...	...	21 32	...	...	...	...	...	21 55	...	...	...	...	...	...	...	...
56 lb. ...	...	...	38 39	...	13 16	27 7	51 54	...	30 47	41 7	36 48	23 0	32 8	...	23 0	...
60 lb. ...	...	...	...	32 15	...	...	...	...	...	...	...	...	...	21 30	...	33 15
64 lb. ...	28 18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unmanured	17 11	19 28	35 13	29 45	12 46	21 6	41 7	20 31	26 7	31 0	30 50	23 4	34 10	16 3	18 59	32 12
Increase ...	11 7	2 4	3 26	2 30	0 30	6 1	10 47	1 24	4 40	10 7	5 58	...	...	5 27	4 1	1 3
Decrease ...	...	...	...	...	...	...	...	...	...	...	...	0 4	2 2	...	...	...

NOTE.—At Narromine and Mungeribar the manured plots of Nabawa were apparently too forward in growth to receive the same benefit from the September rains as the unmanured plots, consequently slight negative results were obtained; observations during August showed much greater development and growth in the fertilised sections. This factor also applied in less degree at Wellington, Toongi, and Eumungerie.

Rate-of-seeding Trials with Wheat.

Four farmers co-operated in conducting rate-of-seeding trials this season with quantities varying from 25 lb. to 70 lb. per acre.

Yields obtained were variable, though, generally speaking, 50 to 60 lb. seed, depending on the time of sowing and the variety, appeared to give best

Cultural Details and Yields of Wheat Variety Trials, Western District (Dubbo Centre).

District	Eurimbla.	Wellington.	Wongarbon.	Nubingerie.	Toongi.	Dubbo.	Dubbo.	Eumungerie.
Experimenter ...	J. D. Berney.	Quirk and Everett.	N. H. Hubbard.	P. J. Baker.	A. J. Harper.	H. J. Harvey.	G. R. Lee.	J. Griffith.
Nature of soil ...	Chocolate clay loam, limestone.	Red clay loam.	Chocolate basalt clay loam.	Chocolate basalt clay loam.	Sandy red to clay loam.	Medium red clay loam.	Medium red clay loam.	Chocolate crumbly clay loam.
Ploughing ...	Disced September.	Mouldboard late August.	Disced August, turning under large crop greenstuff.	Scarified 2½ ins. May.	Disced December.	Disced July–August.	Disc sundercut 2 in. July	Disced August, 3½ in.
Cultivation ...	Harrowed March, scarified early April, and harrowed.	Harrowed mid-February, scarified early April.	Disc cultivated January, spring-toothed early April.	Mouldboard ploughed 4 inches August, scarified February, harrowed late March.	Harrowed February, harrowed March, spring-toothed late March.	Scarified October, again December, spring-toothed with harrows late February, again late March.	Disc ploughed August 3½ inches, spring-toothed early December and early April.	Spring-toothed December, again early February, early April, harrowed late April.
Sown with ...	Combine.	Combine.	Combine.	Rigid-tine combine.	Combine.	Combine.	Combine.	Disc drill.
Date of sowing ...	12 & 13 April.	11 & 12 April.	15 & 16 April.	30 April, 1 May.	20 & 21 April.	22 & 23 April.	23 & 24 April.	28 & 29 April.
Seed per acre ...	55 lb.	50 lb.	55 lb.	60 lb.	50 lb.	50–55 lb.	45–52 lb.	50–55 lb.
Superphosphate per acre ...	64 lb.	50 lb.	56 lb.	60 lb.	56 lb.	56 lb.	56 lb.	50 lb.
After treatment ...	Harrowed after sowing.	Harrowed after sowing.	Cross harrowed.	Nil.	Nil.	Nil.	Nil.	Cross harrowed after sowing.
Remarks	Wild oats very prominent in some plots, reducing yields.	Ground set after heavy rain in April, causing plants to spindle and return light yields.	Currawa lodged.	Variegated thistles and oats numerous. Geeralying and Gullen shelled.	Aussie, Dundee, and Nabawa affected by frosts.	Fed off in late May, which did not improve prospects owing to dry winter.	Ground crusty and uneven in patches.	Germination affected by mice, birds, couch patches, etc.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie	...	...	...	34 21	9 23	...	...	...
Bald Early ...	...	...	...	33 59	...	22 59	...	...
Baringa	...	...	...	...	...	25 12	...	...
Baroota Wonder...	...	18 21	...	29 40	...	17 8	...	...
Barwang	...	19 7	...	...	18 25	...	...	...
Bena	...	...	...	...	...	...	36 7	...
Bobin	...	18 16	41 40	38 17	...	23 0	42 28	29 24
Bredbo	...	18 8	...	...	...	...	...	...
Burrill	34 7	...	34 30	...	...	...	...	...
Cadia	...	...	...	...	20 59	...	...	...
Carinda	22 57	14 41	...	...	...	...	...	...
Currawa	...	...	26 3	...	...	...	...	...
Dundee	40 0	17 41	42 45	32 26	9 20	17 45	...	30 34
Ford	33 45	23 46	39 29	32 36	22 38	27 12	...	28 14
Free Gallipoli ...	...	...	37 50	...	...	...	...	...
Geeralying	...	...	...	31 31	...	18 17	32 39	21 18
Gresley	...	...	...	...	...	...	39 26	...
Gullen	33 54	...	...	36 48	...	24 29	...	...
Nabawa	28 18	21 32	38 39	32 15	13 16	27 7	51 54	21 55
Penny	41 18	...	...	...	...	...	...	...
Rajah	...	...	...	...	...	...	...	27 19
Sepoy	19 39	17 52	...	...	...	...	...	...
Turvey	...	...	...	...	...	...	43 22	...
Waratah	34 31	...	...	20 17	...	...	43 46	...

CULTURAL Details and Yields of Wheat Variety Trials, Western District (Dubbo Centre)—*continued.*

District	Balladoran.	Gilgandra.	Armatree.	Narromine.	Mungeribar.	Wyanga.	Coonamble.
Experimenter... ...	J. Parslow.	W. G. Law.	J. S. Hodgson.	Evan Jones.	J. Maynard.	S. C. Taylor.	H. A. White.
Nature of soil... ...	Variable sandy to clay loam.	Heavy black clay loam, self mulching.	Medium red loam.	Sandy red loam.	Red clay loam.	Medium red loam.	Medium red loam.
Ploughing	Mouldboard 3½ inches, early August.	Scarified mid-February, 1931.	Sundercut 3½ inches late August.	Disced 4 inches September.	Disced December.	Mouldboard, July.	Disc sundercut, December.
Cultivation	Spring-toothed early December, scarified April.	Mouldboard ploughed mid-August, 3½ inches, scarified mid-September, again January, harrowed late March, scarified late April, harrowed 2 May.	Spring-toothed October, disced late December, spring-toothed early April, again late April, harrowed 4 May.	Scarified mid-March, mid-April, late April, early May.	Harrowed early February, again mid-March, spring-toothed late March.	Spring-toothed mid-December, harrowed late March.	Spring-toothed March.
Sown with	Disc drill.	Hoe drill.	Hoe drill.	Combine.	Combine.	Combine.	Combine.
Date of sowing ...	2 & 3 May.	3 & 4 May.	5 & 6 May.	9 & 10 May	12 & 13 May	15 April.	14 & 15 April and 2 & 3 May.
Seed per acre	50–55 lb.	50 lb.	50 lb.	50–58 lb.	50–60 lb.	50 lb.	45 lb.
Superphosphate per acre	56 lb.	56 lb.	56 lb.	56 lb.	56 lb.	60 lb.	Nil.
After treatment ...	Nil.	Nil.	Cross harrowed.	Nil.	Cross harrowed.	Nil.	Nil.
Remarks	Frost damage.	Sown dry on hard crust, drills left open, moisture in plenty underneath; somewhat uneven germination.	...	Soil somewhat too loose.	Mice and turkeys did some damage.	Gullen frosted. All plots affected by dry weather.	...
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bald Early	......	37 10	29 40	......	......	......	26 34
Baringa	......	......	32 26	......	......	20 44	......
Baroota Wonder ...	......	30 5	......	......	......	......	......
Barwang	......	......	......	20 8	......	......	......
Bobin	28 16	36 50	......	24 33	27 44	20 12	24 36
Dundee	27 47	40 5	31 38	21 44	......	22 0	25 53
Duri	......	......	27 54	......	......	......	......
Ford	23 46	47 34	34 2	24 2	33 29	......	30 22
Free Gallipoli ...	......	......	......	......	......	24 54	......
Geeralying	26 23	......	25 56	21 52	27 55	......	21 45
Gluyas Early	25 35	......	......	......	......	......	......
Gullen	27 2	......	......	......	32 40	14 43	29 22
Hard Federation ...	......	......	......	......	......	......	26 44
Nabawa	30 47	41 7	36 48	23 4	34 10	21 30	31 45
Rajah	28 44	55 49	......	......	......	......	......
Ranee	......	......	......	......	30 5	......	......
Riverina	......	......	......	......	33 8	......	......
Waratah	......	......	......	18 56	......	......	......

results. Light seedings allow for better stooling proclivities, but generally do not make up for the density of medium seedings. Heavy seedings frequently demonstrate that lack of soil moisture causes a tendency for plants to hay off and tip.

YIELDS in Rate of Seeding Trials with Wheat.

Seed per acre.	Dubbo. H. J. Harvey.		Wellington. Quirk and Everett.		Gilgandra. W. G. Law.		Coonamble. H. A. White.	
	Area.	Yield.	Area.	Yield.	Area.	Yield.	Area.	Yield.
	acres.	bus. lb.	acres.	bus. lb.	acres.	bus. lb.	acres.	bus. lb.
25 lb.	...	...	...	...	...	...	...	19 26
35 lb.	...	...	3·99	25 8	13·56	23 19	...	...
40 lb.	7·47	28 27	...	...	...	...	...	...
45 lb.	...	...	...	...	...	...	...	22 21
50 lb.	13·15	27 9	5·92	20 23	32·34	23 25	...	...
60 lb.	13·53	29 57	...	...	...	...	...	...
65 lb.	...	...	...	...	18·18	22 41	...	...
70 lb.	...	...	4·39	17 28	...	...	...	...

NOTE.—Bobin wheat was used at Dubbo and Gilgandra; Sepoy at Wellington, and Firbank at Coonamble.

Diseases in the Crops.

Stem rust was again in evidence this season, but fortunately developed too late to do much damage. However, a considerable quantity of second growth in most seasonable crops, and all late sown crops of susceptible varieties were soon hayed off, and the grain pinched as a result of a rapid spread of rust following rains early in November.

Flag smut took its usual toll of susceptible varieties, but the losses are not generally so severe now-a-days owing to the greater use of more or less resistant varieties such as Nabawa, Ford, Riverina, etc.

Take-all and *foot-rot* did considerable damage in the eastern portion of the district around Wellington, Cumnock, Yeoval, etc. These diseases are always to be found there, but were worse this season than usual. Climatic conditions, and perhaps types of soils appear to favour their presence in those parts, whereas the drier Western Plains are not materially affected.

Loose smut was much more prevalent than usual, and caused noticeable losses in some crops.

Frost damage was not extensive this year as was the case last season, though a new type of damage by frost was noticed for the first time. Many well developed ears on stunted stems were frequently noticed, and closer inspection disclosed a bluish-black discolouration above the top node; on peeling off the stem wrapping, the stem itself was found to be cracked both horizontally, and vertically with further marked rotting of straw and discolouration.

Oat Variety Trials.

Oats for grain were tested out at thirteen centres, Algerian being included in all trials as a standard for comparison. This oat is perhaps the best grain or hay variety, provided conditions are suitable for its growth, as was the

case this season when timely rains during September mostly caught it in the right stage to receive optimum benefit, and consequently it topped the yield at seven centres. Frequently, however, with the advent of dry spring conditions it receives a severe check owing to its late maturing habit, thereby

CULTURAL Details and Yields of Oat Variety Trials, Western District (Dubbo Centre).

District	Eurimbla.	Wellington.	Wongarbon.	Nubingerie.	Toongi.	Dubbo.	Dubbo.
Experimenter ...	J. D. Berney.	Quirk and Everett.	N. H. Hubbard.	P. J. Baker.	A. J. Harper.	H. J. Harvey.	G. R. Lee.
Date of sowing ...	12 April.	12 April.	16 April.	1 May.	21 April.	23 April.	24 April.
Seed per acre ...	50–67 lb.	50 lb.	50–60 lb.	50–55 lb.	50 lb.	50 lb.	50 lb.
Superphosphate per acre.	64 lb.	50 lb.	56 lb.	60 lb.	56 lb.	56 lb.	56 lb.
After treatment ...	......	......	......	......	......	......	......
Remarks	......	......	......	......	†	‡	......
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	36 26	37 39	62 22	41 27	31 35	60 6	64 29
Belar	......	43 3	58 34	......	......	48 3	......
Buddah	......	......	63 0	40 30	......	......	34 38
Gidgee	23 23	37 36	......	......	......	29 30	......
Guyra	......	......	......	51 30	......	......	......
Lachlan	32 20	......	......	......	28 35	......	36 10
Laggan	......	38 7	......	48 0	......	25 14	......
Mulga	......	......	......	......	......	......	......
Palestine	*	......	68 14	......	27 31	......	......
Sunrise	......	......	......	......	......	......	......

District	Eumungerie.	Balladoran.	Gilgandra.	Armatree.	Narromine.	Mungeribar.
Experimenter	J. Griffith.	J. Parslow.	W. G. Law.	J. S. Hodgson.	Evan Jones.	J. Maynard.
Date of sowing	29 April.	2 May.	4 May.	6 May.	10 May.	13 May.
Seed per acre	55–60 lb.	50–55 lb.	50 lb.	55 lb.	45–55 lb.	50 lb.
Superphosphate per acre ...	50 lb.	48 lb.	56 lb.	56 lb.	56 lb.	56 lb.
After treatment	......	......	......	......	......	......
Remarks	......	......	......	......	......	......
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	47 16	37 17	67 19	45 0	46 25	64 32
Belar	......	42 3	82 36	48 23	......	57 9
Buddah	......	......	......	......	......	44 32
Gidgee	......	34 13	......	43 13	......	......
Guyra...	33 25	......	......	......	43 9	......
Lachlan	......	......	......	......	......	48 20
Laggan	......	......	......	......	......	......
Mulga	‖	......	......	......	......	......
Palestine	35 12	41 32	83 13	42 29	41 2	59 27
Sunrise	......	......	54 35	......	......	......

* Palestine overgrown by wild oats, cut for hay. † Damaged by frosts. ‡ Fed off lightly.
‖ Mulga lodged and failed.

causing haying off, and poorly matured grain. In addition, Algerian is bitter as a grazing oat, and not palatable during its early stages of growth, and, as a consequence, it is being superseded by other faster-maturing mid-season or early types of oats, such as Belar, Guyra, Gidgee, or Mulga, which are more palatable in their earlier stages of growth and are more likely to mature a hay or grain crop after being fed off.

Reference to the yield table will show some exceptionally high yields this season. Out of a total of forty-eight oat plots, thirty-one exceeded 40 bushels per acre, nine went over 60 bushels, and two topped the 80-bushel mark. These last two yields obtained by Mr. W. G. Law, at Gilgandra, are easily a record for this district, and would be hard to excel anywhere in the State.

The cultural details, etc., were the same as for the wheat plots on the respective farms.

Palestine, a short-strawed, very early maturing variety, again demonstrated its exceptionally high-yielding capabilities; it is an excellent type of grain oat, though the straw is weak. Some farmers are finding it to be a very useful hay oat for farm use on account of the large percentage of grain to straw, also its palatability.

Belar and *Guyra*, mid-season varieties, continued to demonstrate their suitability and adaptability for all classes of soils, and seasonal conditions, as dual-purpose oats. Both are sweet grazing oats, and are less liable to lodge or shell than their faster growing prototypes such as Mulga, Buddah, or Sunrise.

South-Western District Trials.*

The past season demonstrated in a most striking manner that excellent crops can be grown with a low rainfall, provided the falls are opportune. The total falls of rain both during the fallowing and the growing periods this season were approximately 40 per cent. below those of the previous season, yet throughout the far South-west the crops, with few exceptions, were as good and in many cases better.

Because of the extremely heavy rains of April, May and June, 1931, the ploughing of the fallows was generally delayed and many broke up "cloddy." The balance of the year was dry and little effective work could be done. At sowing time fallows, with few exceptions, were not in really good condition and moisture content was patchy, particularly in the western section. In these areas some plots were rather thin, due to unsatisfactory germination.

Plots as far west as Ungarie and Barellan held their own during the abnormally dry winter months, but west of these areas after mid-August, plots started to go back daily. The excellent rains of late August and September coupled with mild weather during October saved the situation and converted what seemed almost certain failures into good yielding crops, particularly at Burgooney, Weethalle, Euratha and Merriwagga.

In the eastern portions of the district the plots did not receive a check, rain frequently falling just when a dry spell looked like doing damage.

* Mr. D. V. Dunlop, Agricultural Instructor, conducted the trials in this district, and the information under this heading is from his report.

The rainfall registrations at the different centres are given in the following table :—

RAINFALL Registrations.

Month.	West Wyalong.	Ungarie.	Tullibigeal.	Lake Cargelligo.	Kikoira.	Weethalle.	Euratha.	Merri-wagga.	Goolgowi.	Barellan.	Ariah Park.	Moombool-dool.	Quandialla.
1931.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
July	76	*	112	82	93	104	114	80	111	73	95	113	137
August	58	*	34	0	66	53	43	22	60	36	77	50	67
September ...	71	*	151	105	129	111	105	110	181	59	94	128	153
October	30	*	20	24	35	36	65	60	71	77	67	29	37
November ...	131	*	178	120	140	118	121	137	123	280	134	113	169
December ...	67	*	29	20	114	39	100	20	7	3	46	0	304
1932.													
January	4	8	0	0	0	12	22	0	0	0	0	0	0
February ...	102	81	30	75	133	78	83	241	195	29	73	75	58
March	141	109	146	131	111	84	94	210	150	138	102	181	228
Total on fallows	680	833	700	557	821	635	747	880	898	695	688	689	1,158
April	263	243	251	282	251	203	178	264	256	293	228	249	140
May	88	72	40	17	31	43	39	42	70	36	62	88	82
June	134	54	42	36	51	104	92	91	52	137	121	93	163
July	138	120	113	56	111	110	72	265	111	196	176	69	189
August	167	136	151	115	168	177	196	88	251	223	231	278	122
September ...	131	166	191	165	216	172	237	112	226	130	132	144	122
October	52	43	60	38	46	32	65	14	19	40	98	26	26
Total on crop ...	973	834	848	709	874	841	879	876	985	1,055	1,048	947	844

* Not available.

Wheat Variety Trials.

Outstanding varieties were Bobin, Dundee, Nabawa and Rajah. Due to the very favourable spring, late-maturing varieties, particularly Sepoy, Gallipoli, Duchess, Bena and Baringa did well. Bobin topped the yields at nearly all centres and is undoubtedly a suitable wheat for these areas. The performance of Dundee indicates that it will be a suitable wheat for early sowing; it yielded splendidly, the sample of grain was excellent and it demonstrated resistance to flag smut. Ford, a wheat of similar maturity also did well, but is not as promising as Dundee, being rather tall growing, with somewhat open heads. It must be remembered, however, that the season helped both these varieties and it remains to be seen how they will react to the more normal dry spring of these areas.

Rajah again did well particularly on the Hillston line. Geeralying was disappointing; due to its early maturity it did not benefit to any great extent from the September rains. Baringa did particularly well at Berendebba, Colinroobie and Barellan.

Diseases were not serious; loose smut was rather prevalent, together with some foot-rot and flag smut in susceptible varieties.

CULTURAL Details and Yields of Wheat Variety Trials.

District	Weethalle.	Merriwagga.	Goolgowi.	Goolgowi.	Tabbita.	Barellan.
Experimenter ...	F. E. Schmidt.	E. S. Hazeldine.	L. Moore.	J. Deegan.	R. E. Brumby	G. Gow.
Nature of soil ...	Medium loam	Light loam ...	Light loam ...	Mallee ...	Medium loam	Heavy loam.
Ploughing	Mouldboard July.	Mouldboard July.	Mouldboard July.	Mouldboard July.	Mouldboard September.	Ploughed July, 1930, flooded; ploughed again September, 1931
Cultivation	Scarified October, springtoothed April; sown with combine.	Nil; sheeped only; sown with combine.	Disced September; sown with combine.	Combined September and March; sown with hoe drill.	Springtoothed February and April; sown with combine.	Scarified September scarified and harrowed April; sown with hoe drill.
Date of sowing ...	23 April.	29 April.	29 April.	25 April.	24 May.	3 May.
Seed per acre ...	50 lb.	50 lb.	50 lb.	46 lb.	45 lb.	50 lb.
Superphosphate per acre	56 lb.	56 lb.	56 lb.	56 lb.	56 lb.	56 lb.
After treatment ...	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks	Germination unsatisfactory; thin stand.	......	Plots eaten out by rabbits; bare until end August.	Geeralying shattered by storm.	......	Two years' fallow.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie	15 28	......	19 22	......	......	......
Bobin	18 25	29 50	18 30	29 29	......	......
Duri	13 15	......	18 53	28 45	......	......
Dundee	19 0	28 34	......	31 7	......	46 8
Ford	16 32	30 2	......	26 54	27 16	42 13
Geeralying	13 11	20 0	......	25 23	......	......
Nabawa	17 51	26 40	......	29 57	......	......
Waratah	13 21	......	16 56	28 40	......	......
Rajah	......	27 52	21 15	......	......	......
Riverina	......	25 2	11 12	......	......	......
Bena	......	......	......	......	34 20	36 40
Gallipoli	......	......	......	......	28 18	44 29
Penny	......	......	......	......	21 58	37 12
Sepoy	......	......	......	......	30 54	......
Yandilla King ...	......	......	......	......	......	35 45
Exquisite	......	......	......	......	......	39 48
Baringa	......	......	......	......	......	47 38
Federation	......	......	......	......	......	39 1

CULTURAL Details and Yields of Wheat Variety Trials—*continued.*

District	Barellan.	Colinroobie.	Moombooldool.	Ariah Park.	Ariah Park.
Experimenter	H. T. Manning.	A. H. Jennings.	P. Corcoran.	D. W. Edis.	G. Ballantine.
Nature of soil	Medium-heavy	Medium loam ..	Mallee ...	Gravelly loam...	Heavy brown.
Ploughing	Mouldboard August.	Mouldboard July.	Mouldboard July.	Scarified August.	Disced August.
Cultivation	Harrowed and cross-harrowed October, springtoothed, harrowed, and cross-harrowed May; sown with combine.	Scarified September, combined twice in April; sown with drill.	Scarified October, springtoothed March, sown with combine.	Combined May; sown with combine.	Harrowed November and March, skim-ploughed April and cultipacked May; sown with disc drill.
Date of sowing	14 May.	30 April.	4 May.	11 May.	10 May.
Seed per acre	60 lb.	60 lb.	50 lb.	60 lb.	60 lb.
Superphosphate per acre	56 lb.	56 lb.	84 lb.	56 lb.	84 lb.
After treatment	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks	......	......	......	......	......
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie	......	......	......	25 12	......
Bobin	28 25	......	28 15	33 12	......
Duri	25 40	......	......	......	......
Dundee	27 50	......	......	28 53	35 19
Ford	......	31 49	22 9	......	34 56
Geeralying	20 50	......	......	24 56	......
Nabawa	24 40	31 19	24 40	25 40	......
Waratah	25 0	......	......	24 43	......
Rajah	28 20	......	......	......	......
Riverina	......	......	......	......	......
Bena	......	31 58	20 6	......	31 24
Gallipoli	......	34 8	20 30	26 34	31 47
Penny	......	29 46	20 55	......	......
Sepoy	......	......	21 9	......	......
Yandilla King	......	30 19	......	......	29 27
Exquisite	......	......	......	......	......
Baringa	......	38 50	......	......	35 8
Federation	......	......	......	......	......
Duchess	......	......	......	......	34 1
Carinda	......	......	......	......	27 23

CULTURAL Details and Yields of Wheat Variety Trials—*continued.*

District ...	West Wyalong.	Blowclear.	Ungarie.	Ungarie.	Weja.	Tullibigeal.
Experimenter	D. & J. Gagie.	S. J. Edgerton.	J. McMahon.	D. N. Johns.	G. A. Wallace.	H. J. Harley.
Nature of soil..	Medium loam ..	Medium loam ..	Medium red loam.	Heavy loam ...	Medium brown loam.	Medium heavy red loam.
Ploughing ...	Mouldboard September.	Mouldboard August.	Disced August	Disced August	Disced August	Mouldboard July.
Cultivation ...	Springtoothed October, again February, April, and May; sown with hoe drill.	Scarified November, harrowed March, combined May; sown with combine.	Combined November, harrowed February, combined April; sown with combine.	Springtoothed November, and again March; sown with hoe drill.	Scarified February, combined April; sown with combine.	Springtoothed October and January, scarified March; sown with hoe drill.
Date of sowing	2 May	9 May	27 April	20 April	29 April	22 April.
Seed per acre ..	60 lb.	55 lb.	53 lb.	50 lb.	48 lb.	55 lb.
Superphosphate per acre	60 lb.	56 lb.	56 lb.	56 lb.	56 lb.	56 lb.
After treatment.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks ...	Germination poor—due in part to use of 3-year-old seed.	......	......	......	......	......
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bobin ...	18 26	29 2	26 45	......	16 12	31 15
Nabawa ...	14 0	......	25 54	......	......	31 5
Aussie ...	17 15	......	......	......	13 30	......
Geeralying ...	10 16	......	22 12	......	14 35	25 26
Waratah ...	16 53	27 12	21 25	......	13 30	......
Ranee... ...	15 19	......	......	......	......	......
Rajah ...	17 2	30 50	26 1	......	20 5	......
Gallipoli ...	18 56	......	......	......	......	28 5
Riverina ...	......	28 34	......	......	16 12	......
Duri	......	26 18	21 37	......	12 57	......
Ford	......	26 59	......	25 30	......	29 20
Federation ...	......	23 40	......	26 32	......	23 27
Dundee ...	......	......	21 31	......	......	29 12
Yandilla King	......	......	......	32 35	......	......
Exquisite ...	......	......	......	30 42	......	......
Bredbo ...	......	......	......	26 3	......	......
Baringa ...	......	......	......	31 12	......	......
Bald Early ...	......	......	......	......	12 57	......
Sepoy ...	......	......	......	......	......	30 33

CULTURAL Details and Yields of Wheat Variety Trials—*continued.*

District ...	Burgooney.	Lake Cargelligo.	Kikoira.	Euratha.	Quandialla.	Berendebba.
Experimenter	Franklin and Cooke.	T. W. Turner.	E. Douglas.	J. R. Somers.	R. Penfold.	P. Coelli.
Nature of soil...	Mallee ...	Medium loam...	Medium loam...	Mallee ...	Heavy self-mulching.	Clay loam.
Ploughing ...	Scarified July	Mouldboard July.	Disced July ...	Disced August	Fallowed 1930; sundercut September, 1931.	Fallowed 1930; skim-ploughed August, 1931.
Cultivation ...	Harrowed August, scarified September, combined March and April; sown with combine.	Combined March and twice in April; sown with hoe drill.	Scarified November and March, combined April; sown with combine.	Springtoothed October and April, combined April; sown with combine.	Scarified February and May; sown with combine.	Scarified November and April; sown with combine.
Date of sowing	22 April.	26 April.	22 April.	29 April.	11 May.	24 April.
Seed per acre...	45 lb.	50 lb.	45 lb.	45 lb.	60 lb.	60 lb.
Superphosphate per acre	56 lb.	56 lb.	56 lb.	56 lb.	56 lb.	56 lb.
After treatment.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks ...	......	......	......	......	Two years' fallow.	Two years' fallow.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bobin ...	23 31	......	25 31	14 52	42 57	......
Nabawa ...	18 31	12 14	24 38	9 32	34 27	35 18
Aussie ...	......	......	......	......	35 23	......
Geeralying ...	......	......	......	7 14	......	......
Waratah ...	20 19	......	......	......	34 56	......
Ranee... ...	......	......	......	......	......	......
Rajah ...	......	......	......	......	......	......
Gallipoli ...	......	12 19	......	......	......	36 8
Riverina ...	......	......	24 58	......	......	......
Duri	......	......	22 54	9 52	36 2	......
Ford ...	18 7	11 24	24 0	......	......	38 50
Federation ...	......	18 32	22 11	......	......	33 20
Dundee ...	22 6	16 39	22 30	11 32	37 48	......
Yandilla King	......	......	......	......	......	38 17
Exquisite ...	......	......	......	......	......	......
Bredbo ...	......	......	......	......	......	31 16
Baringa ...	......	......	......	......	......	41 37
Bald Early ...	......	......	......	......	......	......
Sepoy ...	......	......	......	......	......	......
Bena	......	12 29	......	......	......	34 39
Gresley ...	......	......	......	9 22	......	......
Duchess ...	......	......	......	......	41 56	......

Wheat Rate of Seeding Trials.

The results of the wheat rate of seeding trials were somewhat conflicting, except at Ariah Park, where the following comparable acre yields were obtained with the variety Gallipoli on the farm of Mr. D. W. Edis :—45 lb. seed per acre, 25 bus. 55 lb.; 60 lb. seed per acre, 26 bus. 34 lb.; 75 lb. seed per acre, 27 bus. 14 lb.

Wheat Fertiliser Trials.

In common with previous years, these trials indicated that little advantage is obtained from the heavier applications of superphosphate, the most profitable application being generally about 56 lb. per acre.

RATE of Superphosphate Trial with Wheat.

	No manure.	Superphosphate per acre.					
		28 lb.	38 lb.	56 lb.	84 lb.	95 lb.	112 lb.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Goolgowi (L. Moore—Waratah)	9 5	10 55	...	16 56	11 56	...	...
,, (J. Deegan—Nabawa)	25 13	29 27	...	29 57	28 50	...	...
Tabbita (R. E. Brumby—Bena) ...	...	...	...	34 20	34 20	...	...
Barellan (G. Gow—Federation)	...	...	...	39 1	39 29	...	38 55
,, (H. J. Manning—Bobin)	...	...	...	28 25	30 20	...	29 0
Colinroobie (A. H. Jennings—Penny) ...	...	27 20	29 12	29 46	...	...	...
Moombooldool (P. Corcoran—Penny) ...	...	...	...	19 45	20 55	...	22 10
Ariah Park (D. W. Edis—Waratah)	...	...	...	24 43	25 19	...	25 56
,, (G. Ballantine—Yandilla King) ...	...	...	...	28 12	29 27	...	30 16
Quandialla (R. Penfold—Duri)	...	...	37 45	36 2	...	40 47	...
Berendebba (P. Coelli—Yandilla King) ...	...	...	38 38	38 17	36 48	...	...
Blowclear (S. J. Edgerton—Bobin)	...	27 47	...	29 2	29 2	...	...
Ungarie (J. McMahon—Nabawa)	...	...	23 40	25 54	26 19	...	...
,, (D. N. Johns—Yandilla King) ...	...	31 36	...	32 35	*	...	...
Weja (G. A. Wallace—Bobin)	...	...	16 45	16 12	15 8	...	...
Tullibigeal (H. J. Harley—Bobin)	23 28	26 10	...	31 15	35 26	...	...
Burgooney (Franklin and Cooke—Waratah) ...	15 46	...	20 33	20 19	21 33	...	...
Lake Cargelligo (T. W. Turner—Nabawa) ...	...	11 10	...	12 14	13 41	...	...
Kikoira (E. Douglas—Federation)	...	20 0	...	22 11	25 10	...	...
Euratha (J. R. Somers—Gresley)	6 29	...	...	9 22	10 34	...	10 34
Weethalle (F. E. Schmidt—Waratah) ...	...	11 43	...	13 21	15 32	...	...
Merriwagga (E. S. Hazeldine—Bobin) ...	24 20	26 11	...	29 50	33 33	...	...

* Destroyed by stock.

Wheat Cultivation Experiment.

A cultivation trial was again conducted by Mr. H. J. Harley at Tullibigeal, the yields being as follows :—

Plot.	Cultivation Details.	Yield.
		bus. lb.
1	Scarified March and July, springtoothed October and January, scarified April.	30 39
2	Scarified March, mouldboard ploughed July, springtoothed October and January, scarified April.	32 6
3	Mouldboard ploughed July, springtoothed October and January, scarified April.	31 24
4	Mouldboard ploughed July, springtoothed January, scarified April ...	28 32

The long summer fallowed and ploughed plots showed to advantage this season, and the importance of a spring working was again illustrated by the difference in yield between plots Nos. 3 and 4.

Oat Variety and Fertiliser Trials.

Oats again yielded well, particularly the earlier maturing sorts which are best suited to these areas. Palestine, Guyra and Belar did well at all centres.

Exceptionally heavy yields were obtained on the heavy "Bland" country by Mr. A. L. Harnett at Quandialla. This farmer, as well as Mr. D. N. Johns, conducted oat fertiliser trials with superphosphate and P11 mixture; as in former years, P11 had the effect of reducing the yield.

RESULTS of Oat Fertiliser Trial.

Experimenter.	Variety.	P11 98 lb. per acre.	Superphosphate 84 lb. per acre.	No manure.
		bus. lb.	bus. lb.	bus. lb.
D. N. Johns ...	Mulga	26 12	38 32	33 8
A. L. Harnett ...	Mulga	51 28	60 26	....

CULTURAL Details and Yields of Oat Variety Trials.

District	Quandialla.	Tullibigeal.	Goolgowi.	Burgooney.	Ungarie.
Experimenter ...	A. L. Harnett.	J. Dillon.	J. Deegan.	Franklin & Cooke.	D. N. Johns.
Nature of soil ...	Self-mulching ...	Medium loam ...	See details of wheat plots.	See details of wheat plots.	See details of wheat plots.
Ploughing	Scarified August	Scarified July ...			
Cultivation ...	Scarified October, sundercut November and February, scarified March, combined May; sown with combine.	Scarified August and March, sown with combine.			
Date of sowing ...	13 May.	15 April.	25 April.	15 April.	20 April.
Seed per acre ...	60 lb.	50 lb.	45 lb.	40 lb.	50 lb.
Superphosphate per acre	56 lb.	56 lb.	56 lb.	40 lb.	84 lb.
After treatment ...	Nil.	Nil.	Nil.	Nil.	Nil.
Remarks	......	......	Mulga and Gidgee shattered badly by storm.	......	......
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	62 0	......	......	......	......
Guyra	62 8	31 2	42 4	......	......
Gidgee	50 37	27 34	25 0	34 16	......
Belar	69 37	32 2	......	39 16	......
Palestine	82 28	......	38 36	45 28	47 8
Mulga	60 26	21 13	32 9	28 15	38 32
Buddah	......	20 0	......	......	......

Facts for Northern District Farmers.*

The outstanding feature of the season was the incidence and amount of the rainfall, there being an abundance in December, 1931, and then a shortage until early September. Good rains then caused second growth, which so delayed maturity that some varieties, especially late-maturing sorts, were still sufficiently immature to be subject to stem rust when weather conditions favouring this disease were encountered.

RAINFALL Registrations at Various Centres.

	Oxley.	Currabubula.	Manilla.	Warragundi.	Beetive.	Castle Mountain.	Somerton.	Loomberah.	Duri (Reading).	Duri (Owen).	Gowrie.	Upper Manilla.	The Gap.
September	...	...	...	...	35	...	...	...	...	...	...	...	...
October	...	...	...	...	306	...	...	...	...	...	...	...	...
November	...	...	...	...	84	...	...	...	188	...	...	...	...
December	413	234	...	100	90	774	...	406	435	...	100	...	...
January	43	104	...	104	138	62	...	49	70	...	18	...	...
February	90	38	...	38	28	364	...	186	100	...	104	...	51
March	211	174	253	174	128	322	210	230	178	178	200	174	161
Total on Fallow ...	757	550	253	416	809	1,522	210	871	971	178	422	174	212
April	148	134	158	134	62	148	150	113	130	130	181	210	67
May	60	69	47	69	73	126	64	53	112	112	Nil.	99	130
June	59	122	82	122	36	96	70	49	128	128	135	46	78
July	105	125	115	125	56	219	100	111	162	162	163	88	100
August	103	87	61	87	66	113	65	58	88	88	149	53	82
September	385	387	354	387	513	389	357	362	477	477	386	396	363
October	212	182	335	182	252	124	215	158	81	81	107	246	169
November	60	76	150	121	123	150	62	60	60	60	63	60	33

Wheat Variety Trials.

The result of the incidence of the rainfall was thin stands and poor stooling, with wild oats at several centres, and consequently reduced yields. Harrowing, either as part of the operation of sowing or subsequent to sowing, and repeated should rain fall before the plants appear, will result in the best strike.

As the result of the dwarfed growth until September, the crops were not profitable for winter grazing. Since feeding off enables the take-all fungus to cause greater damage, and close feeding in the winter enables weeds to get a footing, the practice should not be followed with any idea of aiding the crop, but only as a control measure when excessive growth is likely, judged from the weather conditions and soil moisture in the autumn and early winter.

The grey to light red soils from shale, usually gritty, yielded the poorest crops. This confirms previous experience that they have poor water-holding capacity and are not suitable for long fallow where the objective is to store moisture.

* The information in this section was taken from the report of Mr. Mark H. Reynolds, Senior Agricultural Instructor, who conducted the trials in the Northern District.

Cultural Details and Yields of Wheat Variety Trials.

District	The Gap, Werris Creek.	Upper Manilla.	Gowrie.	Duri.	Duri.
Experimenter ...	L. R. Hartin.	A. Nixon.	E. J. Hough.	F. and H. Owen.	V. Reading.
Nature of soil ...	Heavy black, self mulching.	Red, medium, from shale.	Red, medium, part setting from shale.	Setting to self-mulching from shale and basalt.	Setting to self-mulching from shale and basalt.
Ploughing	Disced 3 inches, February.	Disced 4½ inches, March.	Mouldboard 4 inches, December.	Mouldboard, 4–5 inches, March.	Disced, 4 inches, October.
Cultivation ...	Springtoothed, 3 inches February, harrowed March and April; combine sown.	Combined April, springtoothed late April, combine sown.	Disc ploughed, 4 inches February, combine sown.	Harrowed April, combine sown.	Harrowed, January and March, combined March; combine sown.
Date of sowing ...	17–18 May	9–10 May	13 April	22 April	4 May
Seed per acre ...	50 lb.	50 lb.	59 lb.	52 lb.	53 lb.
Superphosphate per acre, lb.	Nil.	Nil.	Nil.	Nil.	Nil.
After treatment ...	Fed-off July	....	Fed-off July	....	....
Remarks	....	....	Federation pinched through rust, and most affected by flag smut.	Poorer crop on light soil. Dundee most damaged by rust.	Yields lower on light soil.
Varieties—	bus.	bus.	bus.	bus.	bus.
Hard Federation	12	....	....	....	....
Aussie	20	....	....	....	....
Geeralying ...	23	....	....	....	39
Ranee	21	....	....	....	....
Baringa	25	....	....	14½	30
Duri	18	....	....	....	....
Bruce	17½	....	....	....	....
Ford	....	....	24	13½	....
Nabawa	....	30	23½	14⅔	....
Wandilla... ...	....	24	....	....	....
Dundee	....	11	....	8⅓	....
Federation ...	....	14½	26½	....	....
Waratah ...	....	....	19	....	34
Clarendon ...	....	....	....	....	30
Riverina ...	....	....	....	....	26
Gullen	....	....	....	....	25

District	Loomberah,	Somerton,	Castle Mountain, Quirindi.	Bective, Somerton.	Warragundi.
Experimenter ...	G. H. Dunn (jr.)	R. D. Walker.	T. F. Upperton.	R. J. Hooper.	T. and D. Scott.
Nature of soil ...	Grey-red, medium, from shale.	Mostly setting, grey and red, from shale and basalt.	Brown, self-mulching, from basalt.	Setting and self-mulching, from shale and basalt.	Red, medium setting, loam.
Ploughing	Mouldboard, 3 inches November.	Disced, 4 inches February.	Stiff-tined, 4 inches, November.	Mouldboard, 4 inches, August.	Mouldboard, 4 inches, December.
Cultivation ...	Springtoothed January, harrowed April; combine sown.	Combine sown	Again January, 5 inches, harrowed January and February, and stiff-tined March; combine sown.	Harrowed twice in February; combine sown.	Combined January and April; combine sown.
Date of sowing ...	26–27 April	14 April	4 May	13 April	19 April
Seed per acre ...	60 lb.	50 lb.	50 lb.	60 lb.	45 lb.
Superphosphate per acre, lb.	Nil.	Nil.	Nil.	Nil.	Nil.
After treatment ...	....	Harrowed, 18 April, fed-off June.	....	....	Fed-off June.
Remarks	Rust and frost, reduced yields.	Stunted growth	....	Rust damaged, all varieties.	Stunted straw but large ears.
Varieties—	bus.	bus.	bus.	bus.	bus.
Geeralying ...	12	....	43	....	....
Ranee	....	....	46	....	....
Baringa	....	7½	42¾	11	43
Ford	....	....	43	7¼	31½
Nabawa	15	8½	38	10	25½
Dundee	....	7	....	....	28½
Waratah ...	15	5	46	....	....
Clarendon ...	11	....	....	....	....
Riverina ...	8	....	42¾	....	....

At Carrabubula stem growth was stunted—mostly 2 feet to 2 feet 6 inches (more in Nabawa)—yet the ample rains of September caused the production of ears 3½ to 6 inches long; evidence that there is no relationship between length of straw and ear.

Generally Baringa wilted most during the dry months, but made good recovery subsequently. Federation at Gowrie, while giving the best prospect in early growth and the highest yield, failed because of the pinched light grain of poor flour content and quality as the result of rust infection. Ford was damaged by the rust attack in November, as were others; usually this wheat is sufficiently advanced at this period to obviate damage from rust.

Flag smut was fairly prevalent, the varieties least affected being Nabawa, Wandilla, Geeralying and Baringa. Ford was affected more than Baringa at Bective.

No bunt occurred in the plots.

Wheat Fertiliser Trials.

Fertiliser trials were conducted with Nabawa wheat at Loomberah and Somerton, the cultural details being the same as in the variety trials. The yields were as follows:—

Fertiliser.	Loomberah (G. H. Dunn).	Somerton (R. D. Walker).
	bushels.	bushels.
Superphosphate, 80 lb. per acre	...	7½
Superphosphate, 100 lb. per acre	25	...
P. 15 mixture, 147 lb. per acre	22	...
Unmanured	15	8½

At Loomberah sulphate of ammonia was applied on 11th July as a top-dressing to an otherwise unfertilised plot. The yield was 15 bushels per acre.

Wheat Rate of Seeding Trial.

Wheat rate of seeding trials were conducted at two centres.

Manilla (W. Bagnall).—Soil, red, medium, from shale; disc ploughed 4 inches March, harrowed April; sown with combine on 20th April. The yields were as follow:—36 lb. seed, 25¾ bushels; 52 lb. seed, 25¾ bushels; 70 lb. seed. 31¾ bushels per acre.

About 50 per cent. of the seed failed to germinate, possibly through the soil crusting.

Currabubula (I. Thornton).—Soil, grey, deep, sedimentary, medium setting; mouldboard ploughed 4 inches October, harrowed December, combined March; combine sown on 26th May. Crop fed off in June.

The yields were as follows:—33 lb. seed, 22¾ bushels; 48 lb. seed, 27 bushels; 61 lb. seed, 23¾ bushels per acre.

In this case also the soil crusted, and possibly 20 per cent. of plants failed from this cause.

Oat Variety Trials.

Oat variety trials were conducted at two centres.

Loomberah (G. H. Dunn, junr.).—Soil and cultural methods similar to wheat varieties. Sown 27th April. Yields were as follows:—Algerian, 44 bushels; Fulghum, 37 bushels; and Mulga, 28 bushels per acre. Fulghum was the densest crop, but the grain was pinched as the result of rust.

Oxley (Forge Bros.).—Soil, red, setting type, from shale; mouldboard ploughed 4 inches November, disc cultivated and harrowed February; sown with combine on 12th April, with seed at 40 lb. per acre. Plots were fed off June to 10th September.

The yields were as follow:—Laggan, 26 bushels; Mulga, 12 bushels; Buddah, 11 bushels; and Palestine, 5½ bushels per acre.

The oats plots did not respond well for grain production when the rain came in September after the dry spell, probably because they were fed off until early September. The shortest season variety (Palestine) made the least recovery, and the headed portions were mostly too short for harvesting.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Coonabarabran	Feb. 28, Mar. 1
Yass (S. C. Sleeman)	,, 28, Mar. 1
Inverell (E. A. Clarke)	,, 28, Mar. 1, 2
Bega	Mar. 1, 2
Dorrigo (A. C. Newman)	,, 1, 2
Maitland (M. A. Brown)	,, 1, 2, 3, 4
Oberon	,, 2, 3
Robertson (W. G. Jenkin)	,, 3, 4
Penrith	,, 3, 4
Queanbeyan	,, 3, 4
Binnaway	,, 7
Bowraville	,, 7, 8
Taralga (W. N. Fitzgibbons)	,, 7, 8
Glen Innes	,, 7, 8, 9
Walcha	,, 8, 9
Bombala	,, 8, 9
Cobargo	,, 8, 9
Nimbin (S. H. Kilmister)	,, 8, 9
Wallamba	,, 9, 10
Nabiac (A. A. M. Clarke)	,, 9, 10
Berrima (H. Richardson)	,, 9, 10, 11
Mendooran	,, 10
Luddenham	,, 10, 11
Cessnock	,, 10, 11
Rydal (H. Murray)	,, 10, 11
Mudgee (T. P. Gallagher)	,, 14, 15, 16
Armidale	,, 14, 15, 16
Braidwood (H. E. Roberts)	,, 15, 16
Macksville	,, 15, 16
Cooma (G. E. Metcalfe)	,, 15, 16
Crookwell (A. G. McDonald)	,, 16, 17, 18
Bowral (E. Waine)	,, 17, 18
Parramatta (H. R. Thurston)	,, 17, 18
Gulgong	,, 21, 22
Bellingen (J. F. Reynolds)	Mar. 21, 22, 23
Tamworth	,, 21, 22, 23
Gloucester	,, 22, 23
Bemboka	,, 22, 23
Goulburn (T. Higgins)	,, 23, 24, 25
Campbelltown (R. A. Sidman)	,, 24, 25
Quirindi	,, 28, 29, 30
Camden (Chas. New)	,, 30, 31, Apl. 1
Taree (C. A. Jackson)	,, 30, 31, Apl. 1
Dungog (W. H. Green)	,, 30, 31, Apl. 1
Gunnedah (R. A. Brown)	April, 4, 5, 6
Muswellbrook (R. C. Sawkins)	,, 5, 6, 7
Sydney Royal (G. C. Somerville)	,, 10 to 19
Kempsey (E. E. Mitchell)	,, 26, 27, 28
Gresford (A. R. Brown)	,, 28, 29
Orange (G. R. Williams)	May, 2, 3, 4
Narrabri (D. McR. Fraser)	,, 3, 4
Grafton (L. C. Lawson)	,, 3 to 6
Maclean (T. B. Notley)	,, 11, 12
Dubbo Diamond Jubilee (F. W. K. Wise.)	,, 16, 17
Casino (E. J. Pollack)	,, 17, 18
Trangie (F. H. Hayles)	,, 30, 31
Tullamore (W. J. Colvile)	July 26
Peak Hill (W. R. L. Crush)	Aug. 1, 2
Trundle (D. Leighton)	,, 8, 9
Condobolin (J. M. Cooney)	,, 15, 16
Bogan Gate (J. T. a'Beckett)	,, 23
Parkes (L. S. Seaborn)	,, 29, 30
Forbes (E. A. Austin)	Sept. 5, 6
Narrandera (J. D. Newth)	Oct. 3, 4
Leeton (E. C. Tweedie)	,, 10, 11

The Baking Quality of Wheat.

Dough Characters as an Indication.

E. GRIFFITHS, B.Sc., Chief Chemist; G. W. NORRIS, Assistant Analyst; and H. WENHOLZ, B.Sc.Agr., Director of Plant Breeding.

The baking quality of wheat is determined finally by its value in the hands of the commercial baker, but it is desirable that some reliable estimate of this quality should be obtained from experimental tests. The baking of small experimental ½ or ¼ lb. loaves is generally adopted as the best means of estimating the commercial baking quality of a sample of wheat when only a small quantity of grain is available. The time and cost involved in such baking tests, however, together with their partial inaccuracy and the difficulty of interpreting the results so as to define clearly the differences between some wheats, have led to the search for simpler and yet reliable methods.

The matter is one of considerable interest to the plant breeder—of much more moment, in fact, than is generally realised by commercial millers and bakers. It must be explained that in the evolution of a new variety by crossbreeding some hundreds of individual plants are grown, each one of which differs potentially in grain quality from the other. Some plants can be discarded on the basis of kernel texture, but of differences in the quality of the gluten of those individual plants which have hard or vitreous grain eye judgment can give no indication. The plant breeder therefore needs first some simple test which will give the best possible indication of grain quality when only a few ounces of grain are available. It must be realised that at this stage in the selection of a new wheat the strains of best baking quality may otherwise be discarded. It is for this reason that the plant breeder is vitally interested in a simple test which will, if possible, be a fairly reliable estimate of baking quality. Later on, when it is required to decide from several fixed lines of a crossbred wheat which is the best to continue from the standpoint of quality, an experimental milling of a small sample of about ¾ lb. can be undertaken, and a small baking test can then be made. It is only when the wheat is grown more extensively that a sufficiently large sample for commercial milling and baking can be supplied.

At every stage in the production of a new wheat some tests are necessary to give an estimate of baking quality, and the simpler these tests are and the smaller the quantity of wheat, flour or dough required for them, the earlier they can be applied with advantage in the production of a new variety if they are reliable.

Testing the Quality of Gluten.

Various methods have been devised to test the combined value of quantity and quality of gluten or the quality of gluten alone in wheat or flour (viz., Engledow's distensometer, Saunder's dough test, Chopin's extensimeter,

etc.), but none of these appears to combine simplicity with reliability as do the wholemeal dough tests of Cutler and Worzella[1] of Indiana, U.S.A., or of Pelshenke[2] of Germany. On this account the latter make a strong appeal to the plant breeder, who has, it seems, at last been provided with an apparently reliable test for total and inherent quality of grain, which will aid him considerably in breeding for improved quality in wheat. The value of these tests for the plant breeder is that they are conducted on such a small quantity of grain and that they can be applied to the grain from a single plant.

In these tests a small dough ball of finely ground wholemeal mixed with 5 per cent. of its weight of compresed yeast is allowed to ferment in a beaker of water kept at a constant temperature of about 32-33 deg. Cent., and the time taken for the dough ball to burst is regarded as a measure of the combined quantity and quality of the gluten. The quality of the gluten is determined by dividing this time figure by the protein content of the wheat. In all the tests so far made with different wheats in different countries with these wholemeal doughs, it has been found that with few exceptions there is a very good agreement between these results and the results of adequate baking tests. It has been shown by Pelshenke, in fact, that in flours of high gluten quality where the differences in baking quality are not distinctly apparent in a straight baking test, but only become apparent in a blend or bromate bake, these differences are made quite evident in the wholemeal dough tests. In a straight baking test, it is the flour of moderate strength which generally makes the best loaf. The value of a flour of high strength lies in its combination with weak flours, and is only determined in a blend baking test with such flours.

From the standpoint of the breeder, these dough tests are regarded as of very considerable importance. The figure for the actual quality of the gluten, obtained by dividing the total quality of the wheat (Pelshenke time figure of fermentation period) by the quantity of gluten (or protein) in the sample, is considered to represent the inherent quality of gluten of the variety. Pelshenke has shown that with few exceptions the same variety shows the same inherent quality of gluten in different years. Good gluten quality is a better guide to the breeder than either total grain quality or protein content, which are largely influenced by environment. It seems, in fact, that a knowledge of this inherent quality of the gluten is more important to the breeder than the results of a baking test.

The wholemeal fermentation tests represent a simple and quick method for testing considerable quantities of breeding material for gluten quality, since only a small quantity of wheat (5 grammes) is required for testing. Breeding for quality in wheat was previously very difficult, because it had only been possible to get sufficiently fixed material for baking tests after the fifth or sixth generation. Selection for quality can now be made on individual plants in the third generation.

Further details as to the method of conducting these tests and the results obtained on commercial varieties of New South Wales wheats will be published later.

Desirable Qualities of Dough.

Recent changes in the baking industry, brought about largely through the greater use of machinery in the mixing of the dough, have increased the demand for higher quality wheat. The baker usually depends on the miller to supply him with a standardised or uniform quality of flour on which he can rely throughout the year to produce good bread without altering his process or methods of dough treatment and baking. Some progressive bakers, however, submit flour to experimental dough tests or experimental baking tests to determine how it should be treated to obtain the best results with it.

One of the first characters of flour which the baker observes is the water absorption, *i.e.*, the amount of water which is required to be added to it to bring the dough to the desired consistency for kneading. Strong flour usually has a good water absorption and yields more loaves of good volume per sack than weak flour. Water absorption thus came to be regarded as a measure of flour strength. In the hands of an expert baker, different doughs can be brought to a fairly uniform consistency, and flours have been graded according to strength by the percentage of water absorbed to bring them to this consistency. Like many other tests, the percentage of water absorption is not by itself thoroughly reliable as an indicator of flour strength or baking quality, but is useful when interpreted in conjunction with the results of other tests.

A strong flour dough also stands the "punishment" of mechanical mixing, as only strong flours produce a dough which has sufficient toughness to stand up to such mixing and to possess "stability" after such treatment. Weak flour doughs are better managed by hand mixing.

Strong flour doughs require relatively longer fermentation periods and more working than weak flour doughs, since they ripen more slowly. Towards the end of the fermentation period, weak flour doughs tend to sag and run flat, while strong flour doughs stand up well and retain a spherical appearance. Kent Jones[6] states that an excellent idea of the strength of the flour can be judged by the feel and spring of the dough at this stage. He states that factors such as the actual moulding of the dough, and the time of "proving" influence the loaf volume considerably, and that he does not like judging flour strength by the size of the final baked loaf, as a weak flour which is "proved" just right will often give a larger loaf than a stronger flour which is "under-proved." He considers that this method of judging the strength of a flour requires the aid of a good practical and expert baker. It has the great disadvantage that the results cannot be adequately recorded (*i.e.*, there are no numerical figures).

In U.S.A. and in Canada, high speed electric dough-mixers are used in the modern bakehouse, and these serve to break down the physical structure of tough doughs made from strong flours. Only the strongest flour doughs will stand much of this treatment and still retain the gluten in a sufficiently unattended condition to hold the gas well during fermentation. Swanson[3,4] of the Kansas (U.S.A.) Experiment Station, has devised a mechanical

dough-mixer which specially subjects the dough to a brief period of severe high-speed mixing, preparatory to a baking test. The quality of flour is determined to some extent by the manner in which the dough develops in this mixer. Weak flour doughs develop very quickly and then break down or become slack, while strong flours have more resistance against the mechanical action. This resistance, which is equivalent to endurance of the dough to prolonged fermentation, is an indication of the strength or quality of the gluten rather than the quantity of the gluten. When the dough is handled correctly in baking tests, loaf volume and texture depend more upon the quality of gluten than upon the quantity of gluten or protein in the flour or wheat, and the use of the high-speed mixer on dough in place of a long fermentation period is considered by Swanson to indicate more accurately the inherent quality of the variety of wheat and to reveal greater differences in varieties than when dough is subjected to the usual mixing and fermentation.

It is also considered that a dough-mixer which withstands high speed mechanical mixing without "slumping" will have what is called "fermentation tolerance." This character not only means that such a dough requires a long fermentation period to get the best results with it, but that it can withstand prolonged fermentation and still produce a good loaf. A weak flour dough will "slacken" badly under such treatment and large masses of such dough cannot be handled satisfactorily in the bakehouse. A flour of good fermentation tolerance gives the baker considerable latitude in his operations, and does not tie him down to rigid time limits and to the exact methods which are necessary when a weak flour of poor fermentation tolerance is used.

Measuring Dough Quality.

Although the abovementioned qualities of dough are mostly known to the practical baker, there was no means of measuring and recording them exactly in experimental tests until a recent German invention, the Brabender farinograph, was devised. The Brabender farinograph is an apparatus designed for testing the quality of the dough by what is claimed to be a practical method of treatment much akin to bakehouse practice. This apparatus records on a graph the changes which take place in the tenacity or stability of the dough during mixing or during fermentation. Strong flour dough does not alter its consistency for some time, while weak flour dough shows a rapid fall in the consistency curve.

The price of the apparatus is very high, but its claim for accuracy in the determination of dough quality may make it an important and useful outfit for the baker as a guide to the proper handling of the dough of any flour, for the miller as an efficient guide to wheat blending, and also for the breeder or the cereal chemist undertaking comparative tests for quality.

Value of Dough Tests.

Some of these dough tests, it is seen, give a close approximation to the manner in which a wheat flour may be expected to behave in the hands of

the baker. Moreover, the city miller, with his modern plant, does not depend solely on locally grown wheat, but draws his supplies from many different districts and varieties of wheat, and as the baker depends on him for the supply of a uniform quality of flour throughout the year, he must use skill and knowledge in the blending of these wheats. In order to blend his wheats most successfully, the miller must conduct some tests on these wheats to get an estimate of their baking value. As a general rule, millers prefer to keep to themselves the nature of the tests they apply to wheat to enable them to blend to advantage. It is known that some millers merely undertake or have undertaken for them a determination of the protein or gluten content of the grain, which, as has been shown, is not thoroughly reliable as a measure of baking quality. In many cases, Australian millers have been abroad, and have purchased apparatus or instruments which they use as trade secrets to determine flour strength or gluten quality. Some of these are instruments for recording the viscosity of a suspension of flour in water (discosimeter). Other machines, such as the distensometer, extensimeter, etc., record the physical characteristics of a dough. While some of these tests are helpful to the miller, they cannot now be regarded as sufficiently reliable for the estimation of the baking quality of a sample of wheat by comparison with the tests referred to here, which are the result of more recent research.

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DISTRICT AGRICULTURAL BUREAU CONFERENCES.

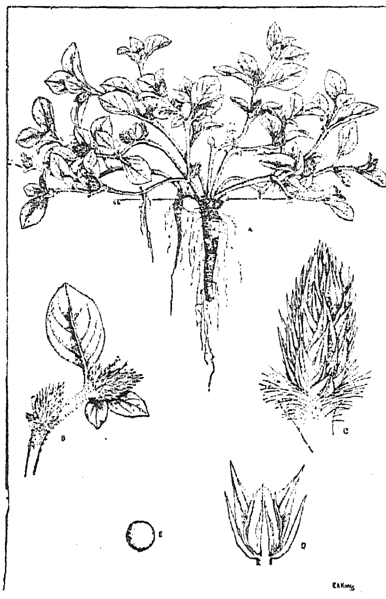
SUCCESSFUL district conferences of the Agricultural Bureau movement were held at Wyong and Harden during February, while those still to be held are:—North-western District at Curlewis on 1st and 2nd March, South-western District at Young on 7th and 8th March, Central-western District at Parkes on 21st and 22nd March, Hunter River and Lower North Coast District at Singleton on 5th and 6th April, South Coast and Monaro District at Merimbula on 27th and 28th April, and the State Conference and annual gathering of the Fruit and Vegetable group in July.

If you want to improve your farming methods join up with the Bureau movement. Full particulars can be had from the Department of Agriculture, Box 36A, G.P.O., Sydney.

Can You Identify Khaki Weed?

REALISING that identification of a weed is the first step in eradication, we reproduce herewith a drawing of khaki weed, which is causing so much concern at the present time in different parts of the State. This weed usually assumes a creeping habit, rooting at every joint, the branches being more or less covered with woolly hairs. The straw-coloured flowers are arranged in heads, usually in the axils of the leaves.

On cultivation areas no great difficulty is experienced in controlling this weed, as it is readily destroyed by ordinary cultivation methods. It is on pasture lands that its eradication is a difficult problem, and, as with all weeds, the best method is to tackle it on its first appearance and prevent its spread. The plants should be dug out before the formation of burrs has taken place, care being taken to pull out the adventitious roots as well as the main root.



Khaki Weed (*Alternanthera echinata*, syn. *A. achyranthera* var. *echinata.*)

A—Plant, showing prostrate habit and root-system.
B—Portion of plant with clusters of flowers.
C—Cluster of flowers enlarged to show sharp-pointed scales.
D—A solitary flower.
E—Seed.

On thinly infested areas, systematic hoeing and burning appears to be the most economical method of control, but it is necessary to cut the plants well below ground level, otherwise fresh growth will be made from the root or main stem. Plants may also be destroyed by covering with salt, or spraying with sodium chlorate or arsenic pentoxide. In experiments carried out by the Department of Agriculture for the destruction of khaki weed by chemicals, good results were obtained by spraying with sodium chlorate at the rate of 1 lb. to a gallon of water, but for thickly infested areas these methods are much too costly.

Once the weed is firmly established it is difficult to suggest measures for eradication which are practical and economic, and the best course appears to be to endeavour to keep the weed in control and prevent it from spreading. In some districts more aggressive plants can be grown to smother out the weed; for instance, on the North Coast the planting of kikuyu grass on infested land has been effective in dominating the weed,

and thus keeping it in control. On the near slopes, in districts where the rainfall exceeds 22 inches per annum, Subterranean clover would doubtless be equally effective.

Stock will eat khaki weed if forced to, and by stocking infested areas heavily with sheep the production of seed will be prevented. This method should at least be adopted for infested showgrounds and recreation grounds, so as to prevent seed being carried to clean areas.

Winter Fodder Crops for the Upper North Coast.

Messrs. McGrath and Woods, Eungella, Murwillumbah; W. R. Beggs, Mullumbimby; J. H. Wylde-Browne, Glenreagh; M. O'Connell, Coramba; and M. McBaron, Raleigh, carried out trials on their farms last winter to determine the most suitable crops to grow for winter fodders in their respective districts.

Very hot dry conditions up till April rendered planting for autumn and early winter feed impossible, and then when rain did come it so interfered with cultural operations that sowing was delayed. The planting dates were: 21st June at Murwillumbah, 23rd June at Mullumbimby, 5th May at Glenreagh, 24th May at Coramba, and 25th May at Raleigh. Owing to the very dry weather and shortage of feed, the Coramba plots were of necessity grazed off, and consequently no results were obtained.

Mr. M. J. E. Squire, Agricultural Instructor on the Upper North Coast, in his report on these trials, included the following table of yields of both the variety and manurial sections of the trial:—

Results of Variety Trials.

Variety.	Murwillumbah.		Mullumbimby.		Glenreagh.		Raleigh.	
	Date Harvested.	Yield per acre.	Date Harvested.	Yield per acre.	Date Harvested.	Yield per acre.	Date Harvested.	Yield per acre.
	1932.	t. cwt. qr.	1932.	t. cwt. qr.	1932.	t. cwt. qr.	1932.	t. cwt. qr.
Wheat—								
Clarendon	12 Oct.	7 0 0	30 Sept.	5 11 2	2 Sept.	9 5 3	15 Sept.	15 7 1
Canberra	,,	7 2 3	,,	7 15 2	27 ,,	9 8 0	,,	9 7 1
Gresley	,,	8 18 2	,,	5 14 1	,,	8 10 2	......	Very poor growth.
Geeralying	,,	8 15 3	,,	6 10 0	,,	7 11 1	......	
Duri	,,	8 6 2	,,	6 11 2	,,	7 11 2	......	
Oats—								
Sunrise	,,	12 5 3	,,	12 0 0	,,	11 13 2	15 Sept.	13 5 3
Buddah	,,	10 12 3	,,	14 0 0	2 ,,	12 0 3	,,	10 0 0
Laggan	,,	8 14 1	,,	11 8 2	,,	12 7 1	,,	12 2 3
Algerian	,,	17 10 0	11 Oct.	13 4 1	24 Oct.	14 4 1	24 Oct.	8 5 3
College Algerian ...	,,	17 0 0	,,	14 8 2	,,	14 5 3	,,	8 [illegible] 3
Cereal and Legume in combination—								
1 part Gresley wheat, 1 part Buddah oats, vetches and field peas.	,,	11 14 1	30 Sept.	13 5 3	27 Sept.	12 4 1	15 Sept.	11 18 2
Rye—Black Winter ...	,,	5 7 1	,,	7 14 1	2 ,,	11 11 [illegible]	2 ,,	10 14 1

Results of Manurial Trials (Clarendon Wheat).

2 cwt. Superphosphate per acre.	12 Oct.	7 0 0	30 Sept.	5 11 2	2 Sept.	9 5 3	15 Sept.	15 7 1
No manure	,,	6 2 3	,,	4 4 0	,,	6 0 0	,,	9 11 2

It is not possible to draw any definite conclusions from these results of only one year's trial, but they are very useful as indicating valuable winter fodders for further trial by farmers.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Baringa	H. J. Harley, "Wattle Park," Tullibigeal.
Bena	Manager, Experiment Farm, Cowra.
Bobin	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	E. S. Hazeldine, "Bunda Farm," Merriwagga.
	H. J. Harvey, "Kindalin," Dubbo.
	D. W. Edis, "Prestonville," Ariah Park.
	A. L. Harnett, Quandialla.
	W. G. Law, "Thistledown," Gilgandra.
	G. T. S. Troy and Sons, "Fairfield," Quandialla.
	H. J. Harley, "Wattle Park," Tullibigeal.
	E. J. Johnson, "Iona," Gunningbland.
	C. Condon, Box 9, The Rock.
	Cullen Bros., "Bunglegumbie," Dubbo.
Canimbla	Manager, Experiment Farm, Cowra.
Clarendon	C. F. T. Anderson, "Swan Vale," *via* Glen Innes.
Cleveland	W. Burns, "Goongirwarrie," Carcoar.
Dundee	W. G. Law, "Thistledown," Gilgandra.
Duri	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Cowra.
Federation	C. Condon, Box 9, The Rock.
Ford	C. Bennett, "Theole," Forbes-road, Cowra.
	W. E. Ditchfield, West Wyalong.
	H. J. Harvey, "Kindalin," Dubbo.
	W. R. Farrall, "Langside," Urana.
	J. B. White and Sons, Boggabri.
Geeralying	H. J. Harvey, "Kindalin," Dubbo.
Gullen	W. G. Law, "Thistledown," Gilgandra.
Nabawa	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	E. S. Hazeldine, "Bunda Farm," Merriwagga.
	Mark Sharman, "Mabruk," Erigolia.
	H. J. Harvey, "Kindalin," Dubbo.
	David Bolte, "Lincluden," West Wyalong.
	W. G. Law, "Thistledown," Gilgandra.

Wheat—continued.

Nabawa—*continued.*	G. T. S. Troy and Sons, "Fairfield," Quandialla.
	C. F. T. Anderson, "Swan Vale," *via* Glen Innes.
	H. J. Harley, "Wattle Park," Tullibigeal.
	E. J. Johnson, "Iona," Gunningbland.
	Cullen Bros., "Bunglegumbie," Dubbo.
	J. B. White and Sons, Boggabri.
Pusa No. 111	Mark Sharman, "Mabruk," Erigolia.
Pusa No. 163	Mark Sharman, "Mabruk," Erigolia.
Queen Fan	C. F. T. Anderson, "Swan Vale," *via* Glen Innes.
Riverina	W. G. Law, "Thistledown," Gilgandra.
	Cullen Bros., "Bunglegumbie," Dubbo.
Sepoy	W. G. Law, "Thistledown," Gilgandra.
Wandilla	W. G. Law, "Thistledown," Gilgandra.
Waratah	H. J. Harvey, "Kindalin," Dubbo.
	G. T. S. Troy and Sons, "Fairfield," Quandialla.
	E. J. Johnson, "Iona," Gunningbland.
	C. Condon, Box 9, The Rock.
	S. W. Brien, "Glen Logan," Cowra.
	J. B. White and Sons, Boggabri.
Yandilla King	Manager, Experiment Farm, Temora.
	David Bolte, "Lincluden," West Wyalong.
	A. L. Harnett, Quandialla.
	A. E. Dixon, "Bramshott," Wallendbeen.
Oats—	
Algerian	W. Burns, "Goongirwarrie," Carcoar.
	C. Bennett, "Theole," Forbes-road, Cowra.
Belar	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Cowra.
	C. Bennett, "Theole," Forbes-road, Cowra.
Buddah	Manager, Experiment Farm, Cowra.
Burke	Manager, Experiment Farm, Cowra.
Gidgee	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Cowra.
Guyra	Manager, Experiment Farm, Bathurst.
Kendall	Manager, Experiment Farm, Cowra.
Laggan	Manager, Experiment Farm, Cowra.
Mulga	Manager, Experiment Farm, Temora.
	C. Bennett, "Theole," Forbes-road, Cowra.
	Manager, Experiment Farm, Cowra.
Cauliflower—	
Mitchell's No. 4	C. J. Rowcliff, Old Dubbo road, Dubbo.
Onion—	
Hunter River Brown Spanish. ...	P. Morandini, Bunglegumbie-road, Dubbo.

Tomato—Strains of tall "Chinese Red," chiefly for glass-houses—

Australian Large Red ...	Manager, Experiment Farm, Bathurst.
Bendigo Large Red ...	Manager, Experiment Farm, Bathurst.
Boyd's Intermediate ...	Manager, Experiment Farm, Bathurst.
——*Other Varieties*—	
Improved Sunnybrook Earliana	A. Sorby, Macquarie Fields.
Break-o'-Day	A. Sorby, Macquarie Fields.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Wheat growing Practices.

As Demonstrated by the Wheat Crop Competitions of 1932.

Points for Growers in the Dubbo District.*

THE old proverb that "It is never too late to mend" was aptly illustrated in connection with the wheat crops in this section of the wheat belt when the timely rains of September, 1932, altered the whole outlook—making good prospective crops better, and apparent failures into profitable ones. Consequently the usual five agricultural associations were again able to conduct local crop competitions, namely, Cumnock (8 entries), Dubbo (12 entries), Gilgandra (25 entries), Narromine (6 entries), and Wellington (18 entries), a total of 69 entries.

Ready for the Harvest.

Competitors at Cumnock, Dubbo, and Narromine were restricted to crops grown on long fallowed land only, which considerably restricted the entries owing to economic considerations, and wet winter conditions, which curtailed fallowing the previous year.

* Mr. B. M. Arthur, Senior Agricultural Instructor, judged the competitions in the Dubbo and adjacent districts and the comments under the above heading are taken from his report.

The Season.

May, June and early July, 1931, were abnormally wet, and this period was followed by extremely dry conditions during August, September, and October. It was only those who seized the opportunity to do their initial ploughing during late July and early August who were able to make any headway in getting their fallowing done. Very little opportunity occurred to work fallows until November and December, when heavy rains delayed harvesting operations and allowed some cultivation to be done in the interim. January and February were mainly dry months throughout the district, though isolated thunderstorms allowed additional workings to be given in some localities. Self-mulching and heavy soils were commonly worked up well in a comparatively dry state. Good rains were received generally during March, and permitted a final working of many of the prepared areas, which in many cases were sown during April under favourable conditions for satisfactory germination results, as good rains were recorded during that month also. The balance of the seeding period was dry with insufficient rains for good germination conditions, though seeding continued to take place until well into July.

The winter rainfall was much below average, and by August the crops were nearly all beginning to show signs of lack of soil moisture. However, rain in mid-September—one of the best ever recorded in that month—worked miracles, and nearly all crops made a remarkable recovery and filled out well. Consequently some very high yields were recorded with plump grain of excellent quality, marred only by the frequent presence of pinched grains from the large amount of second growth which made its appearance in nearly all crops, considerably delaying harvesting operations. Rains early in November brought about stem rust in this late green growth, and it died off in a few days. Some bleaching also occurred as a result of these rains.

The rainfall for the fallowing and the growing periods at the various centres was as follows:—

RAINFALL Table.

	Dubbo.	Cumnock.	Gilgandra.	Narromine.	Wellington.
	Points.	Points.	Points.	Points.	Points.
Fallowing period—(July, 1931, to March, 1932) ...	1,575	1,382	1,290	1,325	1,670
Growing period— (1932)—					
April	224	204	147	175	215
May	29	36	52	30	43
June	95	151	106	81	101
July	96	128	149	110	122
August	115	210	94	157	164
September	461	370	291	408	332
October	36	101	117	44	74
Total	1,056	1,200	956	1,005	1,051
Grand Total ...	2,631	2,582	2,246	2,330	2,721

Cultural Details.

Fifty-four crops were sown on long fallow, the time of the initial workings ranging from February to October. Ten blocks had been prepared for sowing last year, but wet conditions prevented this, and they were perforce turned into fallows. Most of the other fallows were prepared during late July and August.

The disc plough was given preference to the mouldboard, as will be seen in the following table, while twelve competitors relied on the rigid-tine scarifier or springtooth cultivator to do the job.

Most of the crops were put in with the combine, which implement has almost supplanted the seed drill as a means of sowing.

District.	Average number of times fallows were worked.	Initial ploughing done with—		Crops sown with—		Crops sown on—		
		Mouldboard.	Disc.	Combine.	Drill.	Fallow.	Stubble.	Lay or new land.
Cumnock	4·1	3	5	7	1	8	...	...
Dubbo	4	3	9	12	...	12	...	...
Gilgandra	3·5	5	13	19	6	15	8	2
Narromine	3	...	6	4	2	6	...	...
Wellington	4·2	10	3	17	1	11	6	1
Total ...	...	21	36	59	10	52	14	3

The average number of times the fallows were worked after the initial preparation is also shown in the table. The figures are almost identical with those for last year.

Time and Rate of Seeding.

Forty-eight of the competing crops were sown during April compared with sixteen in May, and two in June. Midseason-sown crops did not have good conditions for germination this year, and some malting and patchy results occurred as a consequence. It is opportune, however, to issue a warning to some wheat-growers, who are apparently losing sight of the maturing habit of some varieties, and are tending to sow them far too early, as for instance Nabawa and Waratah in March. This practice is fraught with danger, both from frost damage and from excessive early growth, which feeding off does not altogether counteract.

Seedings have remained fairly constant compared with past years. At Cumnock 58.7 lb. was the average, Dubbo 54.3 lb., Gilgandra 53.2 lb., Narromine 52 lb., and Wellington 57.7 lb. Lighter seedings are advisable in the more western centres owing to generally earlier sowings with consequent better stooling chances; also because of the lower average rainfall.

Only three competitors failed to treat their seed for the prevention of bunt, and one of these crops was very badly infected with the disease. No smut was seen in any of the other sixty-six crops treated with copper carbonate.

Varieties of Wheat Used.

Eighteen different varieties of wheat were exhibited, of which ten obtained places in the competitions. Nabawa was again the most popular variety, but it was not as successful as in the previous year, its place being taken by Ford. The following table shows the varieties entered, and the number of placings gained by each:—

Variety.	Number of times entered.	Placings.			
		First.	Second.	Third.	Total.
Ford	12	2	1	1	4
Yandilla King	4½	1	½	...	1½
Marshall's No. 3	2	1	...	1	2
Currawa	2	1	...	...	1
Nabawa	20	...	1½	...	1½
Bobin	5½	...	1	...	1
Penny	4	...	1	...	1
Geeralying	2	...	...	1	1
Turvey	5	...	...	1	1
Canberra	1	...	...	1	1

Waratah, Aussie, Cleveland, Dundee, Rajah, Baringa, Riverina, and Gullen were also entered, but were not successful.

Nabawa is a great variety, stands up to dry conditions well, is disease resistant, and deservedly popular.

Ford produced some fine crops with clean fine straw. It has a tendency to grow too tall, but prevailing seasonal conditions probably accentuated that condition. It should be a popular early sowing variety.

Bobin is undoubtedly one of the best bag fillers, but unfortunately rather susceptible to rust.

Dundee will be largely grown when seed supplies become distributed. This also applies to *Rajah*, a Victorian crossbred of high yielding capabilities, and *Baringa.*

Of the eighteen varieties exhibited, seven were slow maturers, three midseason, and eight fast growers.

Fertilisers.

Economic conditions—low prices, curtailment of credit, and existing debts—together with the fact that profitable crops were grown last year in a wet season without its aid, were factors mainly responsible for the position that only twenty-five of the competing crops were sown with applications of superphosphate, whereas forty-four were put in without this valuable aid to increased yields.

Fertiliser trials this year have demonstrated a big response to the application of superphosphate, and probably much has been lost by its non-use, but with the prevailing low parity prices of wheat the majority of farmers are definitely not in a position to finance this commodity, which is not essential in all localities.

The average amount used by those competitors who did apply it was 48 lb.—much less than the average amount used in 1930.

Diseases.

Diseases again took their toll, and in some districts certain ones were more prevalent than usual.

Stem rust made its appearance during October in many crops, particularly in the Gilgandra-Eumungerie districts, but owing to a change to cool conditions did not do much damage except in isolated instances. Later, following rains in November, much of the second, or green growth, was quickly affected by rust, and died off rapidly.

Flag smut was again in evidence in susceptible varieties, but the greater use of resistant varieties has tended to reduce largely the losses from this disease.

Take-all and *foot-rot* were very prominent in the Cumnock, Yeoval, and Wellington districts, and were undoubtedly responsible for appreciable losses in many crops.

Loose smut was much more noticeable than in previous years, and in some cases the percentage of loss exceeded anything previously seen. It is probable that seasonal conditions at the flowering stage last year were favourable to infection.

Frost Damage.

Frost damage this year was negligible compared with last year, though it showed up in nearly all crops in a new form. Normally developed heads with stunted stalks where the ear had barely emerged from the shot-blade showed on close inspection external discolouration of the stem wrapping, and a series of cracks, or holes in the stem just above the top node, or knot, and this condition was attributed to the effect of frost.

The Problems of Parkes Growers.*

THE western wheat-grower needs no reminder of the truism, "No two seasons are alike," and the fourteen wheat competitions, totalling 134 entries, conducted in the districts surrounding Parkes during the past year brought to light experiences in crop production that were both interesting and annoying. Even though the wheat season proved to be one of high production, many factors, particularly the prevalence of black oats in some fallowed land; the increased appearance of definite take-all and foot-rot patches; flag troubles abetting the early drying of the wheat leaves, thus causing a premature hardening of the grain in portions of the crop; excessive lodging of bulky crops attended with defective filling of the ears; the thinness of some crops, partly due to seed attack by blue mould, and partly due to poor stooling following late seeding, operated against maximum yields. From a district point of view, the aggregate toll of these defects has perhaps not been noticed in the seven to twelve bag crops, and yet most of them were quite common, and prevented an additional 1 or 2 bushels being bagged. Seasonal conditions were somewhat responsible, but even so, these troubles can mostly be controlled by good farming practice.

* Extracts from the report of Mr. H. Bartlett, Senior Agricultural Instructor, who judged the field wheat competitions in the Parkes and adjoining districts.

Each year the wheat harvest results demonstrate more and more forcibly the soundness of the principles of big crop production as advocated by the Department. The principles of production must first be mastered and then may follow the adoption of minor modifications to suit local conditions. The principles are sound and sure for the production of good crops, while the variation of the detail may be an aid to excellent crops, though attended with some risk.

The Season.

The aggregate falls of rain for the fallow and crop growing periods, *i.e.*, from June, 1931, to March, 1932, and April to October, 1932, respectively, were approximately equal to the general averages of these periods. Heavy June, 1931, rains were followed by a dry spring, and soil conditions were not favourable for fallowing. Excessive rains in November and December, 1931, which damaged the standing crops, supplied good soil and sub-soil moisture to the fallowed areas. Excellent rains in March and April assured good germination of April seedings, and incidentally favoured a profuse and continued germination of black oats. No rain fell between 17th April and 19th May, and some of the early May seedings were attacked by blue mould, such being aided by partly moist seed areas. The winter rainfall was mostly below average and cold temperatures were marked. Crops, particularly the late-seeded ones, made less than normal growth in height and density, and by the end of August the crop outlook was not bright, many areas, some of which were coming into ear, showing signs of wilting. The early September rains, which were followed through to November by more rains and easy temperatures, completely altered the prospects, and crops very quickly promised above average yields. The earlier crops were fit to harvest by mid-November which is a week later than usual, and storms at this time caused some anxiety, but little real damage.

The following table shows the rainfall at a number of centres at which competitions were held and as recorded at the local post offices.

RAINFALL Records, 1931–32.

	Parkes average.	Parkes.	Forbes.	Bogan Gate.	Trundle.	Tullamore.	Peak Hill.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Fallowing Period— (June, 1931, to March, 1932) ...	1,787	1,808	1,605	1,715	1,546	1,505	1,629
Growing Period (1932)							
April	146	306	200	262	272	202	219
May	159	35	62	67	64	133	99
June	237	152	132	94	81	91	107
July	187	169	191	144	138	88	123
August	187	175	160	202	154	113	189
September ...	170	175	262	296	297	353	234
October	154	103	182	95	125	61	147
Total	1,240	1,115	1,189	1,160	1,131	1,041	1,118
Grand Total ...	3,027	2,923	2,794	2,875	2,677	2,546	2,747

Cultural Methods.

In the following table is shown the number of crops grown upon fallowed and stubble land in each competition, and also the average number of times the fallow was worked in each locality. Neither the ploughing or initial working of the ground, nor the sowing, if done with a seed drill, have been included in the number of workings. Where the combined drill was used, it has been counted as a working.

Locality.	Number of crops exhibited.	Number of crops on fallow.	Number of crops on stubble.	Average number of times fallow worked.
Forbes	33	36	7	3·4
Parkes	7	5	2	4·0
Peak Hill	13	13	...	4·2
Bogan Gate	10	10	...	4·3
Tullamore	5	5	...	3·2
Trundle	10	10	...	4·0
Coradgery	8	5	3	3·8
Gunning Gap	3	3	...	4·7
Dunmore	7	5	2	4·2
Nelungaloo	9	7	2	5·3
Filla Fogi	6	3	3	3·7
Alectown	7	5	2	4·0
Top Woodlands	7	4	3	3·5
Wirrinya	9	4	5	3·3
Total	134	105	29	3·9

Of the 134 crops entered, twenty-nine were on stubble land—a greater proportion than usual. Soil conditions during the winter of 1931 were rather difficult, and the immediate cost of fallow workings was a deterrent, while the need for the greatest number of bushels of wheat from the farm suggested the taking of a risk with the season and the sowing of an increased area. The advantage of fallow was forcibly demonstrated by the Forbes competition. Twenty-five crops produced on fallowed land were estimated to yield an average of 34.4 bushels per acre, while eight crops on stubble land promised a yield of 25.9 bushels per acre—a difference of 8½ bushels per acre.

The enforced reduction in expenditure since 1928 has had the effect of reducing the number of fallow workings, but it should be remembered that it is not so much the number of workings the fallow receives which determines its standard, as the times and methods of performance of the work.

The Use of Superphosphate.

The subject of the use of superphosphate for wheat needs very careful examination, lest incorrect deductions be drawn from the bounteous harvests that have resulted in recent years, despite the fact that shortage of cash has compelled the purchase of smaller quantities of this fertiliser.

Experiments and crop competitions over a long period of years have proved the value of superphosphate in the central-west, and the average amount per acre used in competition crops increased annually for some

years to 62.4 lb. per acre in 1930—and this increased application was profitable. The 1932 average application was 44 lb. per acre—back to the 1924 level. Fortunately the seasons have been exceptionally favourable, and the adjustment of practices to immediate conditions (such as very early seeding —which, however, is attended with risk) has lessened the disadvantage. Yields have been most satisfactory, but this fact does not counter the suggestion that yields would have been even better had the proved quantity of superphosphate been used. During the course of the inspections, evidence justifying the use of that little extra quantity was frequently seen.

In unmanured crops and portions of crops the difference in yield was sometimes as much as three bags per acre. These crops amounted to 25.4 per cent. of the 1932 entries, and since they were the best crops of the district, it is likely that in the crops in general the percentage was still greater.

A rather unusual feature, quite common this year, was that many unmanured crops produced the tallest growth. It is well known that superphosphate advances a crop in maturity by about ten days. Up till the end of August the fertilised crops had made the tallest growth; ears were just peeping, and the growth of the stem, except for the heading process, had been completed. With the unmanured crops (which were later), the early September rains stimulated a rapid growth of stem, and the resultant crop was in many cases a foot taller than an adjoining fertilised area. The density, however, was less, but the ears, in some cases, larger. Only a close inspection revealed the advantage of the fertilised area.

The Seed Used.

The amount of seed sown per acre in recent years has shown a somewhat similar rise and fall to the quantity of superphosphate applied. Due to better seed beds, and a higher reserve of subsoil moisture resulting from better fallows, the wheat lands have been able to mature denser crops, which called for an increase in seeding. This increase was steady and constant until 1929, after which finance commenced to force a reduction, and in 1932 the quantity was 54.2 lb. per acre or 90 per cent. of normal (1929). Generally speaking, it is a wise policy to sow at an average of about 60 lb. per acre.

In the 1932 competitions the seed of 94.7 per cent. of the entries was treated with dry copper carbonate, and of the remaining seven, two were treated with bluestone and five were untreated.

Not one bunt-infected plant was seen throughout the judging.

Time of Seeding.

The importance of sowing varieties at their correct time must be again stressed. With the elimination of the late-maturing wheats, and the practical necessity of commencing seeding early in April, the tendency is to sow wheats such as Nabawa, Bobin, and Waratah prior to 15th April. The

result is sometimes excellent yields, but frequently bulky, flaggy, overgrown crops which are subject to excessive lodging, and are open to fungous flag troubles which affect the health and filling of the ears. The frost danger must also be considered. The extra early seeding of these varieties has developed during the past three years as a counter to the failure to use fertiliser, and has answered reasonably well, but better and healthier crops will result from a little later seeding and the use of superphosphate. The more western localities have, of course, a slightly earlier seeding period than the eastern parts.

On the other hand, very late seeding often develops into so much wasted effort, and perhaps direct loss. Not only is the yield invariably light, but as the area has generally been hastily prepared—perhaps as an after-thought—from stubble land, weeds and wheat diseases usually multiply. The lateness of the work throws the farm routine out of balance, and the area of fallow is restricted for the following crop.

The ideal seeding period is from 10th April until 15th May.

The Varieties.

Twenty-two varieties were entered in the fourteen competitions held in 1932, and the placings were as follows:—

Variety.	Number of times entered.	Percentage of times entered.	Number of times placed.			Number of points.	Percentage of points.
			1st.	2nd.	3rd.		
Nabawa	55⅚	41·7	7⅓	6½	4	39	46·4
Waratah	20⅙	15·5	⅚	...	...	2½	3
Ford	16⅓	12·2	3½	4	2	20½	24·4
Bobin	16⅓	12·2	2⅓	½	5⅔	13⅔	16·3
Turvey	2½	1·9	...	...	⅓	⅓	·4
Bena	2½	1·9	...	...	1	1	1·2
Ranee	3	2·2	...	2	...	4	4·8
Riverina	1½	1·1	...	1	...	2	2·3
Schultz	1	·8	...	...	1	1	1·2

The points are calculated in the proportion of 3 for first place, 2 for second, and 1 for third, the total points being 84.

From a competition point of view (and this is also a valuable commercial guide) the one time champion, Canberra, has passed out; from 38 per cent. of entries in 1925 it has now been reduced to 1.1 per cent. Waratah is on the same road; from 1928 onwards the percentages of times this variety has been entered in competitions have been 46.8, 42.3, 36.6, 19.4, and 15.5, while the percentages of points recorded have been 66, 32.4, 36.1, 20.2, and 3.0.

Nabawa entered the list in 1928, and in 1932 constituted 41.7 per cent. of the entries, and scored 46.4 per cent. of the points. Ford appeared in 1931, and with 12.2 per cent. of entries is now in second place with 24.4 per

cent. of points. Bobin is next with 12.2 per cent. of entries and 16.3 per cent. of points. These three varieties together made up 66.1 per cent. of the entries, and won 87.1 per cent. of the points.

Ranee is a variety which is attracting attention in the Tottenham and Wirrinya localities. It is an early, fine-stemmed type of medium height, with medium length, compact ears; it usually yields better than appearances indicate. Although it is somewhat susceptible to flag smut, heavy infections have not as yet come under notice in the west.

Undoubtedly a preference is held by farmers for the earlier-maturing types of wheat, particularly in the western portion of the district. There is room, however, for a later maturing wheat than Nabawa, but one which is earlier than, say, Yandilla King, which would enable seeding to commence in the first week of April without the attendant risk of sowing out of season. Such a place may possibly be filled by Dundee.

The Average Yields in the Competition.

The average yields of the 1932 competitions were:—Parkes, 33.4 bus.; Forbes, 32.4 bus.; Trundle, 33.5 bus.; Peak Hill, 31.8 bus.; Bogan Gate, 35.6 bus.; Tullamore, 23.2 bus.; Coradgery, 34.1 bus.; Nelungaloo, 34.2 bus.; Gunning Gap, 33.0 bus.; Dunmore, 32.5 bus.; Filla Fogi, 27.5 bus.; Alectown, 32.7 bus.; Wirrinya, 29.9 bus.; Top Woodlands, 22.4 bus. The district average of competition crops was 29.25 bushels per acre.

When reviewing the yields of these competition crops, the fact must be kept in mind that they represent the best crops produced by the most progressive farmers. But the averages are a fair and reasonable indication of the yields which are possible over the whole of the respective localities, provided the recommended cultural practices could be uniformly and wholly adopted.

Diseases.

Foot-rot and *Take-all.*—Both of these diseases were more prevalent than for many years past, and probably accounted for a reduction in yield of ½ per cent. over the whole of the district. Of course, many free crops were inspected, but several with about 3 per cent. infection were noted, and one with as high as 20 per cent. It has not been possible to determine whether the increase is due to peculiar seasonal conditions, or to an actual spreading of the disease. The severest infection occurred in a paddock which had been under grazing since 1924, and which was fallowed in September, 1931.

Where infections are troublesome, the only control measures are:—A good stubble burn; a crop of oats; fallow; wheat; and then repeat the rotation.

Flag-Smut.—The control of flag smut is evidently under way—by the growing of resistant wheats. Susceptible varieties were more or less infected, and a portion of Union and some patches of Waratah lost quite 50 per cent. in yield.

Some other flag troubles were probably responsible for the haying off of patches of bulky crops, particularly in the Waratah variety. Part destruction of leaves by heavy winter frosts, by a dry August, and by the fungi of wheat leaf blight and leaf rust had the effect of arresting the food supply to the ears of the wheat, and small patches of crop dried off with the stem still tinted with green. The grain therein was slightly pinched.

Traces of other troubles were noticed, such as glume blotch and basal glume rot, but to such a small extent as to pass unnoticed except for a close inspection.

Not one bunt-infected plant was found throughout the judging.

Room for Improvement in the Mudgee-Coonabarabran District.*

WITH the exception of Coonabarabran the agricultural societies in this district have made only spasmodic efforts to conduct field wheat competitions. Apathy and want of confidence in the potentialities of the district would appear to be the reasons for the lack of interest in the competitions, while strangely enough it has been the use of indifferent cultural methods that has led many landholders to the belief that the climate is peculiarly unsuited to wheat production.

Three agricultural associations conducted crop competitions in 1932, namely, Coonabarabran (24 entries), Mendooran (21 entries), and Baradine (9 entries), and two branches of the Agricultural Bureau, namely, Tambar Spring (7 entries) and Birriwa (8 entries), a total of 69 entries—a distinct improvement on previous years. Baradine was represented this year for the first time in its history, and the Birriwa Agricultural Bureau stepped in and filled the breach in the Dunedoo-Gulgong district.

The Season.

The rainfall for the year, though at times causing much anxiety, can be regarded as satisfactory from a wheat production standpoint. Other than for some of the friable loams, weather conditions were by no means favourable for true summer fallowing. A short break in January provided the opportunity for wide-awake farmers to prepare a limited area, but where this was not availed of, it was necessary to delay preparation until March. To obviate these all too frequent delays which occur with short summer fallow, farmers should endeavour to long fallow at least one-fourth of the area.

A number of faulty stands were noticed among May-sown crops. The irregular germination can be attributed to sowing in a loose seed-bed or sowing at insufficient depth. As a measure of what proved to be false economy, shallow sowing found favour.

*Notes from the report of Mr. G. Nicholson, Senior Agricultural Instructor, who judged the competitions in this district.

The season once again demonstrated the inherent hardiness of wheat and its remarkable recuperative powers after a prolonged dry spell. From April until the latter part of August, the crops were grown on a minimum of moisture, the precipitations being light and subsoil reserves of moisture on summer fallow practically non-existent. However, although the rainfall for this period did not exceed 6 inches, the incidence was most favourable.

A seven weeks' spell of dry weather, commencing in July, checked growth, and seriously affected out of season early-sown crops, but the excellent September rains came in time to revive the midseason- and late-sown crops. Second growth in forward crops was prevalent, more particularly in the early sections of the district.

The rainfall for the fallow and growing periods at four centres was as follows:—

RAINFALL Table.

	Baradine. (C. Bunner).	Coonabarabran. (Purlewaugh).	Mendooran. (O. R. Gavin).	Birriwa. (L. G. Bourke).
	Points.	Points.	Points.	Points.
Summer Fallowing Period (January to March)—				
January	154	176	34	Nil.
February	20	......	114	58
March	340	387	335	307
Total	514	563	483	365
Crop Growing Period (April to October)—				
April	136	150	170	196
May	139	30	48	55
June	106	98	106	83
July	210	143	226	137
August	82	91	115	141
September	380	361	298	459
October	21	195	109	109
Total	1,074	1,068	1,072	1,180

Cultivation Methods.

On comparatively new and fertile country some excellent yielding crops were grown with a minimum of cultivation, the principal factors determining productiveness being a clean stubble burn and ploughing or scarifying the land early and while in a suitable mellow condition. In a favourable season, good returns are possible, provided the cultural work is carried out in an intelligent manner, but with old cultivation land it is an entirely different matter. Time of cultivation and quality of the work done count far more than frequent careless working with no definite objective in view.

Some farmers have been successful in cropping the same land continuously for a number of years, and growing weed-free crops. A close investigation of their methods will disclose that they are thorough and painstaking in every particular. It is most significant that only 17.4 per cent. of the competition crops were produced on country that had grown more than six crops, 62.3 per cent. on country that had grown up to three crops, and 20.3 per cent. on country that had grown from four to six crops. It would thus appear that some growers are relying on the natural fertility and cleanliness of new country to make up for many shortcomings in cultivation. The fallacy of continuous cropping was demonstrated in a practical manner by the weed and disease infested crops, to be seen far too frequently in the older-settled areas.

Eight crops only (11.5 per cent.) were grown on winter fallow, viz.:—Mendooran, 3; Birriwa, 3; and Coonabarabran and Baradine, 1 each. Twenty-four crops (34.8 per cent.) were grown on summer fallow (January-February ploughing) and of the balance twenty-five crops, equal to 36.5 per cent., were sown on March and April ploughed country, and twelve crops (17.4 per cent.) on May and June ploughing. Thirty-four (49.2 per cent.) of the blocks received no cultivation other than ploughing and sowing, and thirty-five, or 50.8 per cent., were cultivated at least once prior to sowing.

Varieties.

Twelve varieties were selected by competitors, a slight increase compared with last year. During the past three seasons there has been a marked improvement in the choice of varieties. Of those exhibited this year it is doubtful if Pusa No. 4, Florence, Free Gallipoli, and Turvey are worth growing, in view of the fact that more suitable and productive or disease-resistant types are available. The popularity of Nabawa and Waratah continued, the former representing 41.7 per cent. of the entries and the latter 24.2 per cent. These, together with Currawa, Ford and Marshall's No. 3, represented 85.6 per cent. of the entries.

The following table shows the placings of varieties:—

PLACINGS of Varieties.

Variety.	Percentage Number of Entries.	Placings.			
		First.	Second.	Third.	Total.
	Per cent.				
Nabawa	41·7	3	2	2½	7½
Waratah	24·2	½	2	2	4½
Ford	7·5	1½	...	...	1½
Currawa	6	...	1	...	1
Marshall's No. 3	6	...	...	½	½

Although the season was favourable to the slow maturing wheats, it is interesting to note that they comprised only 27 per cent. of the total entries and 20 per cent. of the placed varieties. The principal explanation is that these varieties are not receiving the attention they deserve; with some farmers the practice is to grow nothing but quick-maturing sorts, irrespective of the time of sowing. Nabawa is a particular case in point, and sowing early in April frequently results in a partial failure. It is essentially an early to midseason wheat, and does not stand severe grazing. On performances Nabawa fully merits the popularity it enjoys. From the grower's point of view a marked susceptibility to foot-rot, and a tendency for the straw to break down, are its worst features.

Waratah is very suitable for late sowing on the heavy fertile soils, but is inferior to some other wheats on the lighter soils. Ford, though as yet not grown extensively, has made an impressive entry and gives promise of being a valuable variety for early to midseason sowing. It possesses a degree of resistance to flag smut, but is by no means immune to foot-rot. Marshall's No. 3, though gaining only one-half of third place, is the most favoured variety for early sowing. Currawa is popular on the light sandy soils.

Trueness to Type.

There has been a marked falling off in the type and purity of the varieties, only 18 per cent. approaching pure seed standard, while 22.5 per cent. of the crops were badly mixed and totally unsuited for seed purposes. Furthermore 18 per cent. of the crops were grown from ungraded seed. Recently large areas of virgin and weed-free country have been opened up for wheat-growing, but it is indeed false economy to use anything but weed-free seed on these soils. Share-farmers have no permanent interest in land, and it is interesting to note that they were responsible for using 75 per cent. of the ungraded seed. Landholders who value their properties for wheat-growing would be well advised to make arrangements to supply their share-farmers with all seed requirements.

Rate of Seeding.

The rate of seeding shows but slight variation from previous years. On the heavy productive soils moderate seeding is gaining in favour in preference to the heavy rates in vogue a few years ago. The disadvantage of heavy seeding is most marked this season, due to soil moisture deficiency. The following table shows the variations in the rate of seeding:—

District.	Maximum.	Minimum.	Average.
	lb.	lb.	lb.
Coonabarabran	60	45	54
Mendooran	70	45	55·5
Birriwa	62	45	54·6
Baradine	58	45	52
Tambar Springs	60	36	49

Fertilisers.

The position as regards the application of superphosphate remains unchanged. New country, indifferent cultivation, and low prices are not conducive to use of superphosphate. Nine crops were manured, the quantities ranging from 45 lb. to 65 lb., with an average of 52 lb. superphosphate per acre. Manured crops sown early did not derive the same benefit from the September rains as did the unmanured areas. It is known that on the medium loams, providing good cultural methods are employed, payable results can be obtained from light dressings of superphosphate. The friable volcanic loams do not require manuring.

Diseases.

Foot-rot was again by far the most serious yield-reducing disease occurring at all centres. It is assuming serious proportions, and wheatgrowers will have to take definite measures to endeavour to hold it in check. Heaviest infection occurred on newly-ploughed grass country and old cultivation paddocks. Continuous cropping, late ploughing, and heavy grazing —all of which are common in the district—are conducive to the spread of the disease. Nabawa and Turvey are highly susceptible, and Waratah, Ford, Yandilla King, and Currawa show a very poor measure of resistance.

Flag smut was more prevalent than for some years past, but in no instance did it assume serious proportions. Loose smut also was prevalent and appears to be increasing.

A few competitors did not treat their seed for bunt, but, fortunately, the crops were apparently free. As an economy measure this cannot be recommended, since the cost of dusting is inexpensive as compared with the heavy dockages levied on smutty wheat.

A Difficult Year for North-west Farmers.*

THE area covered by this district extends from Springridge to Gunnedah and to Inverell, including Wee Waa, Pallamallawa and Bingara. The result of the competitions and the fact that the usual number of organisations were able to promote competitions attracting ninety-two entries must be considered a triumph for good farming methods in the north-west. The year has been a most difficult one, and for a greater part of the growing period the production of seed only seemed possible. The agricultural societies of Wee Waa, Moree, Narrabri, Boggabri, Gunnedah, Bingara, and Inverell, and the Agricultural Bureau branches at Treloar Springs and Myall Creek (Delungra) conducted competitions. At Bingara a 25-acre competition was also conducted.

*Mr. J. A. O'Reilly, Agricultural Instructor, judged the competitions in this district, and these remarks are extracted from his report.

The Season.

The rainfall during the fallow and growing periods at a number of centres was as follows:—

RAINFALL.

	Wee Waa.	Moree.	Pallamallawa.	Narrabri.	Boggabri.	Bingara.	Gunnedah.	Delungra.	Inverell.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Fallow period (January to March)	353	216	258	478	464	690	372	502	458
Growing period—									
April	155	202	311	142	99	251	93	418	505
May	148	64	150	176	116	117	98	113	83
June	118	100	89	121	104	102	87	116	127
July	60	95	171	149	126	217	78	231	153
August	44	46	47	52	63	89	62	37	46
September ...	318	376	358	471	300	452	365	396	412
October	40	211	129	74	238	282	332	181	383
Total, Growing period	883	1,094	1,255	1,085	1,046	1,511	1,115	1,495	1,709
Grand Total ...	1,236	1,310	1,513	1,563	1,510	2,201	1,487	1,987	2,167

The best rains in the fallowing period were in the early part of December, 1931, and in March 1932. The Inverell end of the district, which includes Bingara and Myall Creek, fared better for rains in the fallowing period than the remainder of the district. January and February were particularly hot and dry throughout the district. The rains in March were generally useful, but though the monthly totals of April and May appear to be good the falls were mostly light in character. The germination was generally good, but in some sections of the district, especially Gunnedah, where under an inch was registered for each of the first five months of the growing period, some trouble was experienced in getting a good germination. In this area again the total during the growing period was well up to the average, but this was due largely to rains in October that subsequently proved to be the cause of reduction in yield of late crops and second growth, as rust developed in these crops.

June, July and August were generally dry, and many severe frosts were experienced during this period. A welcome break occurred about the middle of September, which generally enhanced the filling of the forward and well-developed crops. The second growth in crops which were being affected by dry conditions caused considerable inconvenience and delay at harvest time.

Cultural Details.

The quality of the crops on winter fallow and on early worked short fallow was apparent throughout the district. Farmers are again reminded of the soundness of the Department's recommendation of allowing a third

of the cropping area out in winter fallow each season and introducing a crop of oats for grazing into the system. During the past five years the best crops in the competitions and the best farm averages have been produced when following along the above lines.

Twenty-five per cent. of the crops were grown on fallow this year as compared with 8 per cent. last season, whilst a little over 4 per cent. of the crops were sown on land which had previously grown oats.

The number of times the fallows were worked did not vary much from last year, but Gunnedah and Boggabri show an increase due to the number of winter fallows included. The important factors to be considered in the working of the fallow are early initial working. for greater penetration of moisture, and effective control of weeds, to minimise loss of soil moisture, by utilising sheep on the fallow, and, if necessary, the springtooth cultivator and rigid scarifier.

Number of times the fallows were worked:—Wee Waa 1.8, Moree 1.9, Narrabri 2.8, Boggabri 3.5, Gunnedah 3.3, Treloar Springs 2.0, Bingara 1.8, Myall Creek (Delungra) 2.6, Inverell 2.5.

Varieties.

Ford, Nabawa, and Waratah were again the outstanding varieties. Ford was entered 39 times, and secured $5\frac{5}{6}$ first places, $5\frac{1}{2}$ second places, and $3\frac{5}{6}$ third places. Although it did not figure in the first place in the district championship it secured the next three places. Waratah is still behaving satisfactorily, although it was only entered $9\frac{2}{3}$ times, as against 18 last year. It secured $\frac{5}{6}$ firsts, $2\frac{1}{2}$ seconds, and 1 third. Nabawa appeared $24\frac{5}{6}$ times as against 47 last season. It shared the championship honours with Waratah and Geeralying. This was the only appearance of Geeralying. Currawa, Aussie, Pusa No. 4 and Canberra filled minor places. Hard Federation was entered $1\frac{1}{3}$ times and secured $\frac{1}{3}$ first and $\frac{1}{2}$ third. Marquis, Queen Fan, Cleveland, Marshall's No. 3, Florence, Duri, Gluyas, Early and Bobin were entered, but failed to gain places.

Seed and Fertiliser.

The average rate of seeding at the various centres was as follows:—Wee Waa, 49.3 lb. per acre; Moree, 49.1 lb.; Narrabri, 42.1 lb.; Boggabri, 43.5 lb.; Gunnedah, 43.6 lb.; Treloar Springs, 45.5 lb.; Bingara, 49.4 lb.; Myall Creek (Delungra), 43.8 lb.; and Inverell, 52.6 lb. The average rate of seeding in the competitions was 46.5 lb. as against 48.5 lb. last season.

As was the case last season, not one of the crops entered in the competitions was treated with superphosphate. The soils of the north-west are generally well supplied with phosphoric acid, and superphosphate plays little or no part.

Diseases.

The crops in the competition were generally very free from disease this season. Foot-rot was the most noticeable disease, and this was confined principally to the Inverell section of the district. It was thought that with

comparatively dry autumn conditions flag smut would be prevalent, but in competition entries the infection, even in susceptible varieties, was only slight. Rust was responsible for damage to late crops in the district, but generally in the competitions the damage was negligible. Loose smut was noticeable in practically all varieties, but the infection was not great.

Bunt was seen in one competition entry, and it is evident that it is still in the district; consequently farmers should be wary of sowing untreated seed.

General.

Large areas of old cultivation land are heavily impregnated with black oats, and the low prices prevailing for wheat render it almost impossible to produce wheat profitably on this class of country. Farmers should concentrate on a smaller area, and seize the opportunity of fallowing some of this country in order to bring it back to a condition whereby profitable crops can be produced.

Each year an improvement in the standard of seed is noticed and the crops generally give a better average return.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1933 planting season :—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son, Carlingford	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson, Ermington ...	2,000	2,000	700	1,000	500	6,200
Swane Bros., Ermington ...	1,000	1,000	250	500	500	3,250
Geo. McKee, Ermington ...	1,000	2,000	...	...	...	3,000
C. Langbecker, Bundaberg, Queensland	...	750	...	...	250	1,000
F. Ferguson and Son, Hurstville	2,000	3,000	...	...	...	5,000
A. T. Eyles, Rydalmere ...	3,000	2,000	...	...	...	5,000
R. Hughes, Ermington ...	500	500	250	500	1,000	2,750

—C. G. SAVAGE, Director of Fruit Culture.

Anything New in Onion Growing?

Can You Get 22 Tons of Onions per Acre?

MR. P. MORANDINI, Bunglegumbie-road, Dubbo, who secured first place in the recent onion growing competition conducted by the Dubbo P.A. and H. Association, grew a crop of Hunter River Brown Spanish variety which yielded 22 tons 12 cwt. per acre. To good seed and good cultural methods can be attributed much of Mr. Morandini's success. The preparation of the ground was begun in 1931 by ploughing under an April-sown crop. Water melons were then sown, and after that crop was harvested the land was

Mr. Morandini's Crop of Hunter River Brown Spanish.

mouldboard ploughed, harrowed and rolled in May, 1932, and springtooth cultivated prior to transplanting the onion seedlings in June. Superphosphate at the rate of 200 lb. per acre was applied just before planting out. The seedlings were transplanted 4 inches apart in rows 9 inches apart, and to facilitate irrigation the beds were made only 10 to 12 feet wide by 34 feet long.

The Best Time to Sow Onions at Bathurst.

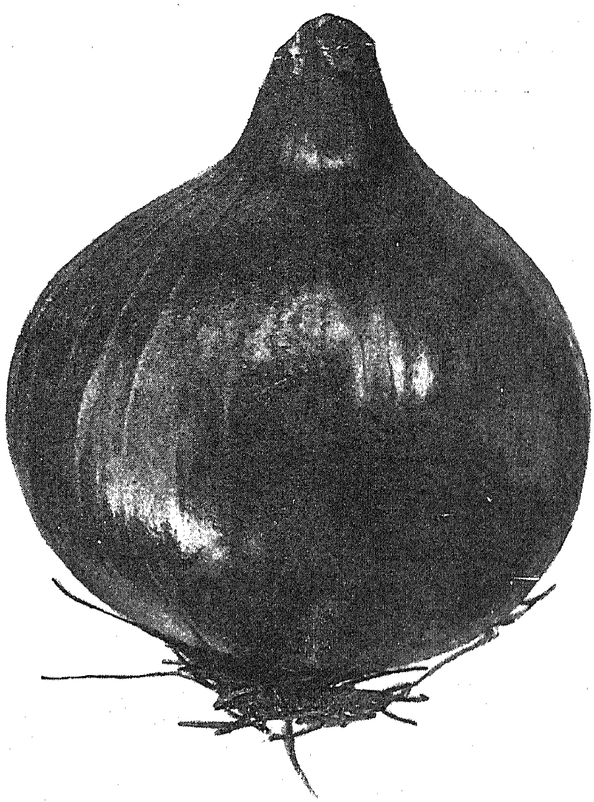
WHEN the decrease in yield due to sowing onions at the wrong time may amount to over 3 tons per acre, where is the point in sowing at anything but the right time?

Experiments carried out on the light granitic soils at Bathurst Experiment Farm last year again indicated that March and April sowings are the best for early maturing onions. This is in keeping with the results obtained in each of the past five years. March and April sowings have also favoured the later-maturing onions, although last season the yields favoured

May sowing. Summarising the experiments to date, Mr. G. T. Dawson, the Experimenter, says that it is certainly inadvisable to sow the later-maturing onions before the 1st of March or later than early May. January and June sowings are quite unsuitable.

Superphosphate and Bonedust for Onions.

An application of 3 cwt. of a mixture of superphosphate and bonedust is a payable proposition when growing onions on the light granitic soils of the Bathurst district. Trials have been carried out for some years now



Hunter River Brown Spanish.

at Bathurst Experiment Farm and increased yields have resulted in all years irrespective of the kind of season experienced.

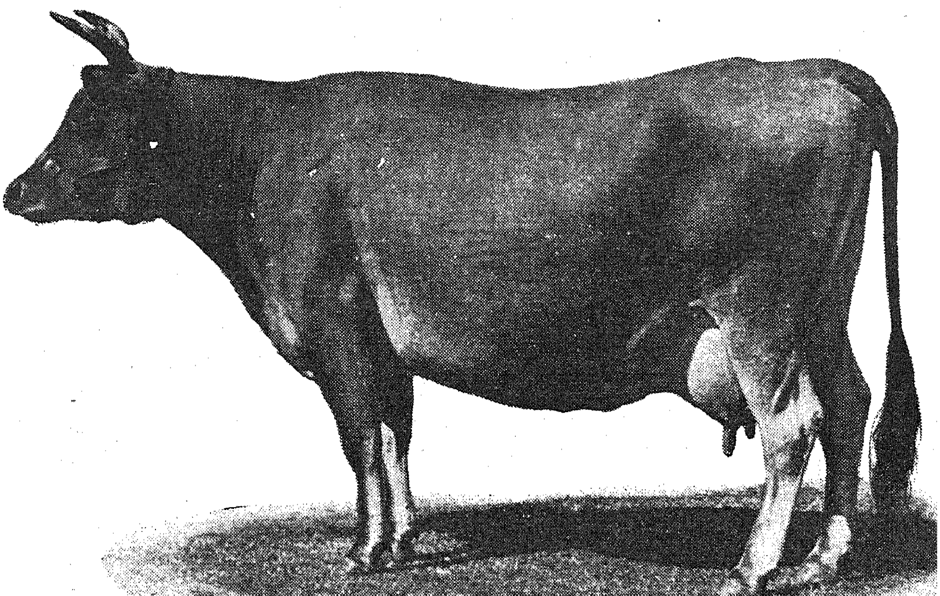
As the increase due to the fertiliser was around about a ton per acre last year, it is left to the reader to work out the profitableness of the practice.

A mixture of equal parts of superphosphate and bonedust has also given excellent results in other onion growing districts and it is generally recommended by the Department as the best fertiliser for onions.

Dairying and Livestock Notes.

How a World's Champion is Fed.

THERE is a well-founded saying to the effect that it is not possible to get from a cow more than you are prepared to put into her in the form of feed. Thus, whenever a new record is established, the dairy farmer immediately becomes interested in how the record-producer was fed. Many have asked that question since 1st February, on which date the 13-year-old Jersey cow Wagga Gladys completed her 273 days' lactation period with a world's record butter-fat production for her breed of 935.23 lb. (from 17,202 lb. milk). Wagga Gladys is a member of the Hawkesbury Agricultural College



Wagga Gladys: World-famous Jersey.

Jersey herd, and this is the second occasion on which she has established a world's record. Chief interest now centres in whether she can better the 365 days' record of 1,220 lb. butter-fat held by the New Zealand Jersey cow Woodlands Felicie.

Although varying slightly from month to month during the lactation period, throughout the greater part of the time she was fed on the following ration:—Ensilage 20 lb., lucerne chaff 10 lb., and 3 lb. of a mixture of bran 100 lb., linseed meal 50 lb. and bone-meal 3 lb. In addition, for every gallon of milk produced, her daily ration was augmented by 2 lb. of a mixture comprising bran 100 lb., maize-meal 80 lb., crushed oats 30 lb., and

linseed 20 lb. The grazing varied considerably. During the winter months there was a fair picking of green barley and green wheat, and at other times she was given an occasional day's grazing on short lucerne.

No very special treatment was meted out to Wagga Gladys. She remained with the College herd except during the days when they had to travel more than half a mile to the grazing paddock. She was milked twice a day throughout the test.

Bone-chewing on the South Coast.

ELSEWHERE in this issue are set out the conclusions of Messrs. Max Henry (Chief Veterinary Surgeon) and M. S. Benjamin (First Analyst) based on a preliminary survey of the problem associated with mineral deficiency in the southern coastal belt of New South Wales.

The report of these investigations, which is of particular interest to dairymen, has been running through the last three issues of this *Gazette*. Some fifty-six samples of far south coast soils were analysed, as were also the pastures from certain of these areas on which stock had exhibited mineral deficiency troubles. From the evidence collected a general correlation was proved to exist between the condition of the stock and the chemical composition of the soils and pastures; in short, that the deficiency in phosphorus of the soils of the south coast is the ultimate cause of osteomalacia among cattle in that area. Very concrete recommendations for counteracting the trouble are set out, and it is claimed that by adopting these measures the returns to farmers on mineral-deficient country can be definitely increased. The recommended measures are:—(1) The application of superphosphate to the pastures in the form of a top-dressing; (2) the feeding of bone-meal and phosphatic licks generally to cattle; (3) the addition of bran to the ration of milking cows; (4) the feeding of cattle on crops grown on manured land; (5) the introduction of new pasture plants, particularly legumes, to the pastures.

Free leaflets on all these subjects—bone-chewing, feeding of dairy cows, top-dressing of pastures, licks for stock, etc.—are available for the asking. Write to the Department of Agriculture for a copy of the "List of Publications."

Points in Preparing a Cow for the Show.

THE first point to consider is whether the beast is to be shown in the "dry" or in the "in milk" class, said Mr. C. G. F. Grant (the Department's Herd Master) in reply to an inquiry as to how to prepare a Jersey cow for the show.

If in the "dry" class, the cow should be mated so as to be within a week or two of calving at time of showing. If in the "in milk" class, it is advisable to mate her so that she will have calved a week or two prior to show day. Mated in this way, the beast can be shown to best advantage, provided other particulars as to condition, etc., are attended to.

The next work to concentrate upon is to teach the animal to lead, walk, and stand correctly, to become used to hand-feeding, drinking out of a bucket, and not to fret when tied up. Work in preparation for showing should begin at least two months prior to the show.

The animal should not be overfed, or fed with too much concentrates. The ration fed will depend on what fodder is available and the expense you are prepared to meet. Oaten chaff, bran, crushed oats and linseed meal, together with lucerne hay, are ideal fodders to feed when preparing a beast for the show. The amounts fed will depend on the size of the animal and the quantity she will consume without getting too fat. The addition of linseed meal aids in the preparation of the coat.

About a week before the show, the animal should be clipped all over, except the brush of the tail and the forehead. When clipped, she should be rugged and groomed well. Do not overdo the washing of a beast for show. A few days before the show, the horns may be scraped with a piece of glass bottle, and then smoothed with emery paper or whiting paste. As a final polish, rub the horns dry and apply an oily cloth (olive oil).

Have a clean, attractive-looking halter to lead the beast around the ring, and concentrate your attention on making your beast show herself to the best advantage. "Showmanship" is everything when you take up the showing of cattle seriously.

The Bull may Transmit Contagious Abortion.

THERE appears to be some doubt in the minds of many farmers regarding the role which the bull may play in transmitting contagious abortion, says the Chief Veterinary Surgeon (Mr. Max Henry), who goes on to point out that the bull may act as a transmitting agent in two ways. Firstly, if used for service with a diseased cow, the bull may transmit the condition to a healthy animal in a mechanical fashion, while, secondly, if the bull itself is infected it may convey the organism to the cow in the process of service. It must not be forgotten, however, that ingestion of the disease organisms with the feed is the common method of infection. This fact was very definitely proved by experimental work carried out in various countries shortly after the Danish veterinarian Bang demonstrated the fact that a particular organism was the cause of this condition.

Alleged Cures for Contagious Abortion.

IN recent numbers of this *Gazette* the present situation regarding contagious abortion has been clearly set out. Nevertheless, it is felt desirable again to draw attention to the fact that there is no proof whatever that any drugs can be effectively used medicinally as a "cure" for abortion.

The opinion of the American veterinarians is fairly clearly set out in the report of their sub-committee in 1932, in which it was stated that medicinal agents are of little or no value in the control of Bang's disease (contagious abortion).

It appears clear that scientific thought in Great Britain agrees with this opinion, as in a recent address on the subject, the Director of the Veterinary Laboratories of the Department of Agriculture in England stated that medicinal treatment appears at present to offer little (if any) help.

Stockowners should, therefore, be extremely cautious in accepting any statements made regarding the medicinal cure of this disease.—MAX HENRY, Chief Veterinary Surgeon.

How to Erect a Bull Shed.

THE erection of a bull shed and the provision of a separate bull paddock involve a principle of great importance to every dairy farmer. Too many dairymen allow the bull to run at large with the herd. The practice is dangerous from the point of view of disease, it is wasteful from a breeding point of view, it prevents records of service being made, and it means a lack of system and efficiency. Most farmers know the value of a good bull, but having got one, not every farmer is alive to the importance of looking after the animal properly. It is to such that the accompanying plan of a bull shed may appeal.

How U.S.A. Deals With the Cattle Tick.

REFERRING to the success with which tick eradication work has been carried out in the United States, the *Kansas City Times* says:—

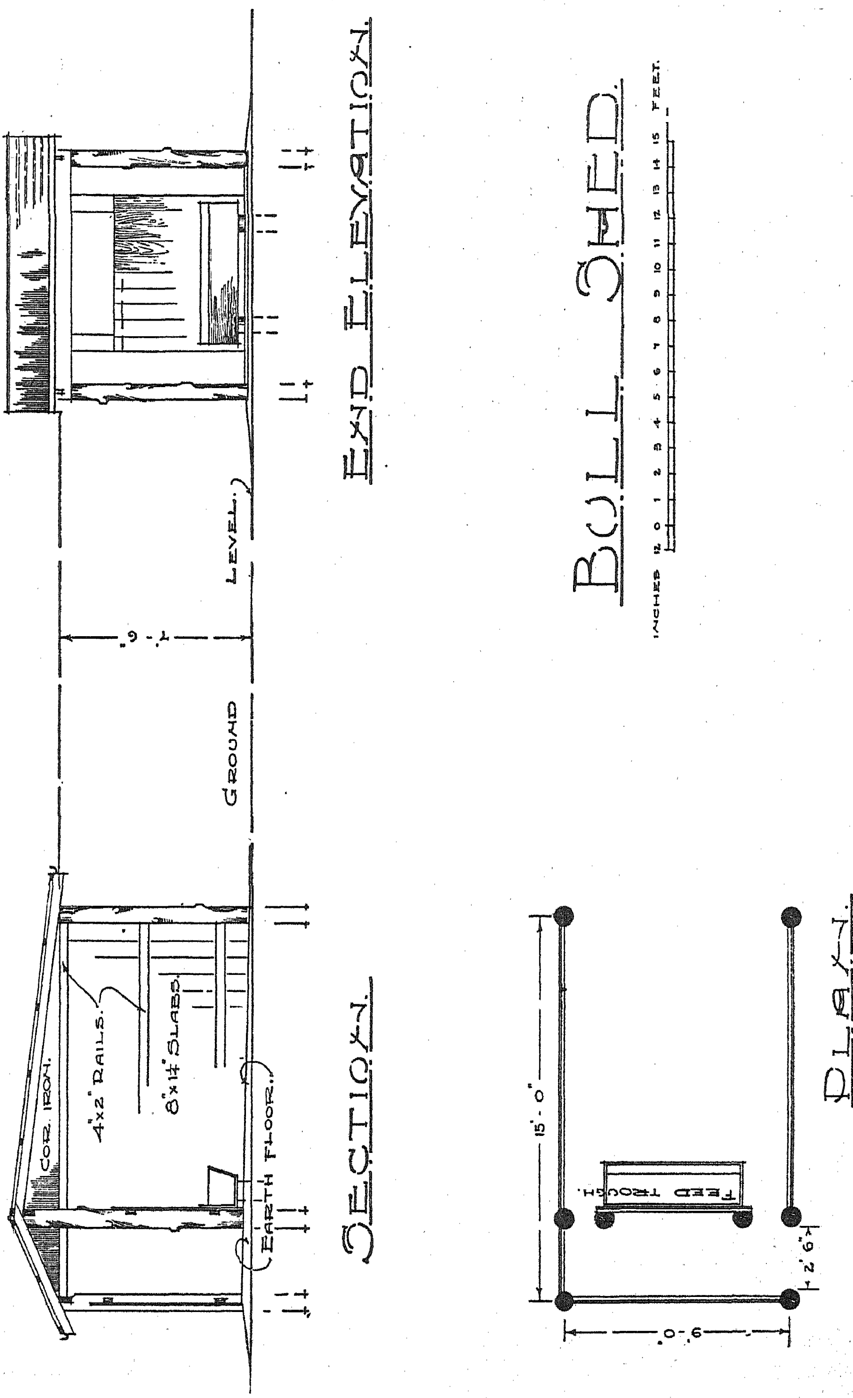
"Splenetic or tick fever in cattle is practically a thing of the past. In fact, ticky cattle have not been even a minor market factor here since 1927, and not an important factor since before the War.

"Of the area originally quarantined, 88 per cent. will have been freed by systematic eradication under the supervision of the Department of Agriculture, when the most recent Federal order becomes effective on 5th December. This order will remove from quarantine 20,290 square miles in Arkansas, Florida and Texas.

"This release of territory in Arkansas makes it the twelfth State to gain freedom from the quarantine embargo. The States previously released were Alabama, California, Georgia, Kentucky, Mississippi, Missouri, North Carolina, South Carolina, Oklahama, Tennessee and Virginia.

"After 5th December the area remaining under quarantine will be confined to parts of Florida, Louisiana, Texas and Puerto Rico."

Apparently the officers responsible for carrying out this work in U.S.A. have received the full support of the stockowners, and have, therefore, been able successfully to prosecute their campaign. If New South Wales stockowners were to extend the same assistance and support to the officers engaged in tick eradication work here it should be possible to secure the same satisfactory results.


END ELEVATION.
BULL SHED.
INCHES 12 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 FEET.
LEVEL GROUND
7'-6"
COR. IRON.
4"x2" RAILS.
8"x1½" SLABS.
EARTH FLOOR.
SECTION.
FEED TROUGH.
15'-0"
9'-0"
2'-6"
PLAN.

Bull Shed.

Repeated Inspections for Cattle Ticks are Necessary.

A Case in Point.

STOCKOWNERS who contend that it is unnecessary to examine cattle more than once when searching for cattle ticks in any particular area will have to revise their ideas on the subject, as it took no less than three inspections to discover recently the infestation on the property adjoining the Tabulam-Tenterfield stock route, just north of Drake. The point to remember is that ticks may remain dormant in pastures for months before being picked up by stock, and consequently repeated inspections are necessary if safety is to be assured.

The discovery of the tick west of the quarantine areas and adjacent to the stock route mentioned above necessitated the placing of an additional area in quarantine. Roughly speaking, this area comprises the country on both sides of the route from Ti-tree Creek to Sandy Hills. It is now necessary for all cattle leaving this area to be treated twice before proceeding to clean country. Further information as to the action to be taken regarding cattle in this area can be had from Inspector Glennie, at Bonalbo, or Inspector Kennedy, at Tenterfield.

The Chief Veterinary Surgeon (Mr. Max Henry) advises that further work has been commenced west of the boundary of the Moreelah quarantine area, as there is grave reason to fear that the cattle tick may be west of this country, infected properties being discovered right on the boundary itself. Additional precautions are therefore considered necessary in order to safeguard the clean country. All cattle passing from the north or east through Tenterfield are being examined as far as possible. Objection has been raised to this inspection on the grounds that cattle tick would not live at Tenterfield. There is no evidence, however, to show that this is a fact, but in any case in order to prevent tick-infested cattle moving to other parts of the State where cattle tick certainly would flourish it is essential that such inspection should be carried out.

Odds and Ends.

Treatment of Ringworm in Cows.

First of all it is necessary to soften the scabs by the application of kerosene. The scabs should when soft be scraped with a piece of wood so as to allow the dressing to penertate and reach the infected area.

A dressing which gives very good results is 10 per cent. of oil-of-tar in olive or rape oil. This dressing should be applied twice weekly on at least four occasions. Care should be taken to see that the whole area, including the borders, is treated.

Dairy Factory Employees' Scholarship Awarded.

The scholarship valued at £80 donated by Norco Co-op. Limited, for the second year of the Dairying Diploma Course at Hawkesbury Agricultural College, has been awarded to Michael James Weir, of Ballina.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
Liverpool State Hospital, Liverpool	72	3 Mar., 1933
Lidcombe State Hospital and Home	149	3 ,, 1933
G. L. Genge, " Easton," Armidale	33	4 ,, 1933
W. T. Herbert, Racecourse Farm, Bega	40	7 ,, 1933
C. J. Parbery, Allawah, Bega	108	8 ,, 1933
Miss Brennan, Arankamp, Bowral	17	8 ,, 1933
G. W. Young, " Boorganna," via Wingham	41	10 ,, 1933
Newington State Hospital and Home	100	17 ,, 1933
George Rose, Aylmerton	3	23 ,, 1933
Riverina Welfare Farm, Yanco	89	24 ,, 1933
Department of Education, Yanco Agricultural High School	39	24 ,, 1933
Mittagong Farm Homes	36	24 ,, 1933
Lunacy Department, Kenmore Mental Hospital	80	27 ,, 1933
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	21	28 ,, 1933
P. M. Burtenshaw, Killean, Inverell	66	6 April, 1933
J. P. McQuillan, Bethungra Hotel, Bethungra	20	6 ,, 1933
A. D. Frater, " Fairview Dairy," Inverell	51	6 ,, 1933
A. H. Pye, Loch Levan, Inverell	47	7 ,, 1933
W. Newcomb, " Minnamurra," Inverell	72	7 ,, 1933
Rydalmere Mental Hospital	77	7 ,, 1933
St. Joseph's Girls Orphanage, Kenmore	11	13 ,, 1933
St. Joseph's Convent, Reynold-street, Goulburn	3	14 ,, 1933
St. Michael's Novitiate, Goulburn	4	14 ,, 1933
Marion Hill Convent of Mercy, Goulburn	47	15 ,, 1933
G. A. Parish, Jerseyland, Berry	93	21 ,, 1933
Australian Missionary College, Cooranbong	72	5 May, 1933
W. M. McLean, Five Islands Road, Unanderra	76	6 ,, 1933
Koyong School, Moss Vale	3	11 ,, 1933
Tudor House School, Moss Vale	21	13 ,, 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	226	2 ,, 1933
W. Hammond, Bellingen	77	16 ,, 1933
Hurlstone Agricultural High School, Glenfield	44	22 ,, 1933
E. C. Nicholson, Jillamatong, Corowa	180	23 ,, 1933
St. John's College, Woodlawn, Lismore	47	23 ,, 1933
Grafton Experiment Farm	271	14 July, 1933
P. Ubrihien, Corridgeree, Bega	123	15 ,, 1933
William Thompson Masonic Scool, Baulkham Hills	37	20 ,, 1933
A. Shaw, " Ardshiel," Craven Creek, Barrington (Milking Shorthorns)	100	20 ,, 1933
G. V. Ralston, " Porphyry," Seaham	98	21 ,, 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook	37	17 Aug., 1933
A. L. Logue, Thornboro, Muswellbrook	36	17 ,, 1933
E. W. Flower, Binna Burra	56	18 ,, 1933
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	43	25 ,, 1933
Sacred Heart Convent, Bowral	10	26 ,, 1933
Lunacy Department, Parramatta Mental Hospital	12	1 Sept., 1933
Department of Education, Gosford Farm Homes	38	2 ,, 1933
James McCormack, Tumut	98	9 ,, 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1933
G. Powell and Sons, " Loch Lomond," Armidale	22	26 ,, 1933
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1933
E. E. McMullen, Springnook, Holbrook	31	3 Nov., 1933
W. R. Boughton, Holbrook	33	3 ,, 1933
C. Maynard, Holbrook	12	3 ,, 1933
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1933
Stace Bros., Taylor-street, Armidale	26	1 Dec., 1933
J. L. W. Barton, Wallerawang	20	1 ,, 1933
Department of Education, Brush Farm, Eastwood	8	3 ,, 1933
Lunacy Department, Morisset Mental Hospital	27	7 ,, 1933
W. W. Martin, " Narooma," Urana Road, Wagga	150	14 ,, 1933
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1933
E. E. Winder, Wybong Road, Muswellbrook	40	22 ,, 1933
Strickland Convalescent Hospital for Women, " Carrara," Rose Bay	8	9 Jan., 1934
G. H. Hooper, Oak Hill, Bethungra	10	19 ,, 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys)	80	22 ,, 1934
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	13	27 ,, 1934
J. B. Burtenshaw, " Sunnyside," Inverell	42	27 ,, 1934
Parker Bros., Hampton Court Dairy, Inverell	82	27 ,, 1934

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 Jan., 1934
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1934
W. K. Frizell, Rosenstein Dairy, Inverell...	37	2 ,, 1934
W. Pigg, Redlands Dairy, Inverell	27	2 ,, 1934
New England Girls' Grammar School, Armidale	29	3 ,, 1934
A. N. de Fraine, Happy Valley Dairy, Inverell	[illegible]8	3 ,, 1934
J. Davies, Puen Buen, Scone (Jerseys)	191	9 ,, 1934
Forster & Sons, Abington, Armidale	189	12 ,, 1934
A. B. Finney, Fox Ground, Gerringong	33	17 ,, 1934
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 ,, 1934
St. Patrick's College, Goulburn	8	21 Sept., 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 ,, 1934
Wagga Experiment Farm (Jerseys)	53	25 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone	92	9 Nov., 1934
Wolaroi College, Orange	11	10 ,, 1934
Wollongbar Experiment Farm, Lismore (Guernseys)	123	11 Jan., 1935

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis :—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—MAX HENRY, Chief Veterinary Surgeon.

Abortion-free Herds.

THE following herd has been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free, and unless otherwise declared this certification remains in force until the date shown :—

Owner and Address.	Number in herd.	Expiry date.
Martin Bros., "Narooma", Urana Road, Wagga Wagga	86	28 Feb., 1934.

—MAX HENRY, Chief Veterinary Surgeon.

INFECTIOUS DISEASES REPORTED IN JANUARY.

THE following outbreaks of the more important infectious diseases were reported during the month of January, 1933 :—

Anthrax	1
Blackleg	5
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	3
Swine fever	Nil.
Contagious pneumonia	1
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

Mineral Deficiency in the Southern Coastal Belt of New South Wales.

A Preliminary Survey.

[Concluded from page 123.]

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon, and M. S. BENJAMIN, D.I.C., Lond., A.A.C.I., First Analyst, Chemist's Branch.

In the previous sections of this article the authors discussed analyses of fifty six soils from an area of the far South Coast of the State and of pastures from certain of them in their relation to the clinical evidences of mineral deficiency exhibited by the stock run on these holdings.

From the data presented a general correlation was shown to exist between the condition of the stock and the chemical composition of the soils and pastures.

This concluding section consists of a general discussion of the factors which affect the chemical composition and the grazing value of pastures.

Factors Which Affect Chemical Composition and Grazing Value of Pastures.

THE nature and amount of protein and other nutrients which a pasture contains, the presence in it of organic substances other than nutrients which are of physiological importance, as well as its mineral content, constitute broadly its value for grazing purposes. The work carried out by Woodman[10] and others at Cambridge; Richardson[11] and co-workers at Waite Institute, South Australia, and many other investigators, has shown the important effect which such factors as soil composition, species of plant, stage of growth, moisture supply, and mean temperature have on the mineral content and the feeding value of pastures. In the present survey some indication of the effect of initial percentages of available phosphoric acid in the soil on the amount of phosphoric acid and protein in the pasture grown thereon was obtained, as may be seen from the following figures:—

Laboratory Nos. of Soils and Pastures.	Available P_2O_5 in Soil.	P_2O_5 in Pastures.	Protein in Pastures.
	Per cent.	Per cent.	Per cent.
44	·0022	·274	6·6
47	·0016	·225	6·5
48	·0015	·170	6·6
55	·0080	·555	15·4

Soils and pastures Nos. 44, 47 and 48 were from "affected" areas while No. 55 was from a "non-affected" area.

These figures correspond with those recorded by Henry[12] in connection with mortalities on the South Coast. Of four pasture samples taken from

holdings on which cattle exhibited depraved appetites, the percentages of P_2O_5 were ·27, ·24, ·30 and ·30 respectively, whilst two similar samples from holdings on which depraved appetite was not observed yielded ·56 per cent. P_2O_5 in each case.

That pasture plants of different species, even when grown in the same soil under similar conditions in respect to moisture supply and temperature have widely different contents of mineral matter and protein has been shown. Thus the introduction into pasture of those strains of plants which exhibit a high capacity for the absorption of minerals and the manufacture of protein must be considered an important means, among others, of combating a tendency to mineral deficiency in stock.

The relative richness of some pastures in mineral matter and protein is well illustrated by the following figures which were recently obtained for several Subterranean clover pastures from Bombala and Crookwell. The figures for the twenty-one "affected" natural pastures in the Eden Pastures Protection District are added by way of comparison:—

PERCENTAGES of Lime, Phosphoric Acid and Protein in Dry Matter of Pastures.

	CaO.	P_2O_5.	Protein.
Subterranean clover pastures	2·05	·59	21·40
Natural pastures from "affected" areas, Eden Pastures Protection District	·575	·272	8·05

It is of interest to compare the average percentage amount of phosphoric acid in these twenty-one natural pastures obtained from "affected" areas in the Eden Pastures Protection District with the percentages amounts of this constituent which have been found to occur in pastures and hays in affected areas elsewhere:—

Hays or Pastures from "Affected" Areas in—	P_2O_5 in Dry Matter.
	Per cent.
Eden Pastures Protection District (average of twenty-one natural pastures) ...	·272
South Africa ...	·212
Kenya Colony ...	·220
Norway ...	·142 ·155
Germany ...	·210 ·258
Wisconsin, U.S.A. ...	·200 ·267
Minnesota, U.S.A. ...	·208 ·245

It has been shown that the mineral composition and nutritive value of a pasture is considerably affected by its stage of growth and the frequency with which it is cut or grazed. The lime and phosphoric acid content of natural pastures on different holdings must, therefore, to some extent be influenced by the grazing practices adopted thereon. The species of plant which predominates in a pasture has likewise an effect, apart from other factors, on its calcium and phosphorus content. The legumes tend to absorb from the soil a greater amount of mineral matter, particularly calcium, than do the grasses, and it is possible that the presence in a pasture during certain periods of the year of herbage plants, which have a high capacity for mineral absorption, may be connected with the non-occurrence of osteomalacia on certain properties.

As pointed out by Richardson[11] "species show a differential ability to absorb insoluble phosphate from the soil, and mineral deficiency may be due not so much to actual shortage of mineral material in the soil as to a shortage of available minerals, or to a restricted feeding ability on the part of the plant."

The points mentioned, together with a due recognition of the fact that the demand for phosphorus varies considerably with different classes of stock, and that lactating cattle require more of this element than do dry cattle and steers, should doubtless be kept in mind when considering the incidence of osteomalacia on various properties, and when attempting to correlate strictly the occurrence of this disease with the phosphorus content of the pasture.

Assuming phosphorus deficiency to be, in the main, the cause of osteomalacia or the chief predisposing condition for its development, it follows that grazing methods which ensure an adequate supply of this element in the pasture and soil treatment and pasture management which provide conditions favourable for the growth and survival of pasture and herbage plants of high phosphorus absorbing power, must be regarded as among the more important means of meeting the demand for phosphorus which is made by heavy milk secretion, and so eliminating osteomalacia from the herds.

It is true that inorganic phosphorus supplied in the form of sterilised bonemeal has proved a useful means of supplementing that contained in the pasture, but our knowledge, nevertheless, of the precise nature of phosphorus assimilation and metabolism is too limited to assume that such inorganic phosphorus is wholly equal in value to the phosphorus supplied by young and nutritious pasture, which is known to contain organic phosphorus compounds and other compounds, like the carotinoids, which may well be regarded as playing some part in phosphorus assimilation by the animal and which are, of course, not contained by the components of an ordinary phosphatic lick. Moreover, in the case of a truly inorganic source of phosphorus it may be found that the proportion of this element absorbed by an

animal could be increased by the use of a compound other than tri-calcic phosphate. It has been stated by Cooper and Wilson[13] that phosphorus assimilation both by plants and animals proceeds best from compounds with relatively high ionisation constants.

The Calcium and Phosphorus Content of Pastures and Stock Foods in Relation to the Requirements of Dairy Cattle.

Among the various mineral substances which modern bio-chemical research has shown to be of profound significance in the vital processes of both plants and animals, lime salts and phosphates occupy an important position. In nutrition and metabolism the demand for calcium and phosphorus appears almost continuous during the life of the organism.

Phosphorus is required for bone formation, but in addition is essential for the carrying out of many bio-chemical processes upon which the well-being of the animal ultimately depends. As a constituent of nucleic acid and the phospho-lipins, phosphorus is necessary for the normal functioning of the body cells and for those general processes of metabolism which result in growth and other changes. As disodium phosphate it plays a part in keeping the blood and other fluids almost neutral, while in the form of a hexose phosphate it is necessary for the oxidation of glucose and the liberation of muscular energy.

It may be fairly affirmed, therefore, that a deficiency of phosphorus in an animal's food may result in a general disturbance of physiological balance without actually producing a condition which is definitely a pathologic one. Extreme deficiency of the element in question may result in osteomalacia, but the latter condition is probably for quite a long time preceded by general ill-health—an "off" condition of the animal, which, although not recognisable as disease, is nevertheless a departure from normality.

Calcium, like phosphorus, is of great importance so far as skeleton formation is concerned, and like the latter element it also plays a large part in those vital processes which take place in the cells and tissue fluids of the animal body.

In milk production both elements are heavily drawn upon, and it has been shown that even on a diet definitely low in phosphorus and calcium, the proportion of these elements in the milk remains nearly constant during comparatively long periods, the phosphorus and calcium in the skeleton being drawn upon by the animal to make good the deficiency of these elements in her feed. From this point of view we may even regard bone formation as a reversible process and the skeleton as a natural reservoir of these elements which can be drawn upon in cases of emergency and increased by the feeding of suitable foodstuffs, good pasturage, and mineral supplements.

In the case of highly bred milch cattle the calcium and phosphorus requirements are particularly heavy, since in addition to the normal body processes, bone building and foetus formation, common to other animals, the relatively

large supply of these elements contained in the milk represents an extra and often very heavy demand during lactation periods. It is of interest to consider, therefore, in this connection, the amounts of these two elements which occur in pasture and in some common dairy stock foods. Good pasture and milk according to Orr[14] are not greatly dissimilar in mineral composition, and the amounts, in grams, of lime and phosphoric acid which occur in quantities of the undermentioned foods equivalent in energy value to 1,000 calories are given by him as follows:—

Foodstuff.*	Lime.	Phosphoric Acid.
	per cent.	per cent.
Cow's milk	2·38	3·43
Good pasture	3·64	2·75
Maize	·03	1·83
Turnips	1·18	1·96
Decorticated cotton-seed cake ...	1·22	11·26
Molasses	5·35	·56

* In quantities equivalent in energy value to 1,000 calories.

For the elaboration of milk, good pasture must therefore be regarded as more favourably balanced in respect to its content of lime and phosphoric acid than is the case with the majority of other stock foods.

That the amounts of these constituents vary considerably in Australian stock foods is indicated by the following table compiled by Brunnich[15]:—

LIME and Phosphoric Acid in Common Foodstuffs.

Fodder.	Amount per 100 lb. Fodder.	
	Lime.	Phosphoric Acid.
	lb.	lb.
Lucerne hay	2·00	·56
Paspalum hay	·50	·38
Couch grass hay	·80	·63
Pumpkins	·03	·15
Mangels	·03	·09
Bran	·09	3·00
Maize	·02	·70
Linseed meal	·50	1·70
Cocoanut cake	·32	·94
Sorghum silage...	·11	·24

The table shows that bran and maize are relatively poor in lime, while these foodstuffs and others like linseed meal and cocoanut cake are rich in phosphoric acid. Lucerne hay, on the contrary, is particularly rich in lime, containing three and a half times more of this constituent than phosphoric acid.

In the case of the grasses mentioned the percentage amounts of lime and phosphoric acid would appear more evenly balanced.

That the question of balance between these two constituents in a pasture or foodstuff may be important has been indicated in an earlier part of this article, and although the question of securing adequate amounts of these mineral substances in the animal's diet is the chief end to be kept in view, the maintenance of a suitable ratio of lime to phosphoric would appear also desirable.

In connection with the data obtained for the natural pastures from the Eden Pastures Protection District it is of interest to compare the percentage amounts of lime and phosphoric they were found to contain with the percentage amounts of these constituents which have been found in natural pastures and hays grown on "non-affected" and "affected" areas in other parts of the world.

LIME and Phosphoric Acid in Foreign Hays and Pastures.

	Percentage Amounts.	
	Lime.	Phosphoric Acid.
	per cent.	per cent.
Non-affected Areas—		
Great Britain; cultivated pastures (48)	1·10	·76
Kenya Colony; natural pasture (non-affected) ...	·90	·82
New South Wales; natural pasture top-dressed or non-affected areas	·88	·53
Norwegian hay (non-affected area)	·88	·44
Germany (Wolff); normal hay (non-affected) ...	1·06	·58
Affected Areas—		
Kenya Colony; natural pasture (affected area) ...	·48	·21
New South Wales; natural pastures (21)—Eden P.P. District (affected area)	·57	·27
Norwegian hay (affected area)	·46	·15
Germany (Klimmer and Schmidt); hay causing brittle bone	·50	·27

Conclusions.

It is considered that the results obtained from this investigation justify the conclusion previously arrived at—that the deficiency in phosphorus of the soils of the South Coast is the ultimate cause of osteomalacia amongst cattle in that area, and therefore the recommendations made with a view to counteracting this condition can be repeated with confidence, whilst more recent results from the top-dressing of pastures with superphosphates enables them to be extended.

It is therefore considered that in the affected areas the economic return from the country can be definitely increased by—

1. The application of superphosphate to the pastures.
2. The feeding of bonemeal and phosphatic licks generally to cattle.
3. The addition of bran to the ration of milking cows.
4. The feeding of cattle on crops grown on manured land.
5. The introduction of new pasture plants, particularly legumes, to the pastures.

It is desired to express appreciation of the services rendered in connection with this investigation by Mr. McCulloch, who was at the time Inspector of Stock for the Eden Pastures Protection District, and who collected samples and reported on stock. It is further desired to thank Mr. Moffitt, Inspector of Stock at Moruya, for similar assistance; and Miss Ida Brown, D.Sc., Linnean Macleay Fellow in Geology, for valued advice in connection with the geological formation of the area concerned.

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WHEAT PRICES ON SYDNEY MARKET, 1890 TO 1932.

THE following table, showing the average prices of wheat for February and March of each year and also the average yearly price since 1890, was compiled from figures obtained from the Government Statistician :—

Year.	February.	March.	Average Price for Year.	Year.	February.	March.	Average Price for Year.
	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.
1890 ...	3 6	3 6	3 7¼	1911 ...	3 7¾	3 5	3 6
1891 ...	3 7½	3 10	4 3	1912 ...	3 9¼	3 8½	4 1
1892 ...	4 9	4 9	4 8½	1913 ...	3 6½	3 7	3 2¼
1893 ...	3 6½	3 6	3 6½	1914 ...	3 8	3 9¼	4 1½
1894 ...	2 11	2 8	2 9½	1915 ...	5 6	5 6	5 5
1895 ...	2 7	2 7	3 4	1916 ...	5 1¾	5 0¾	4 10
1896 ...	4 4½	4 5	4 3¼	1917 ...	4 9	4 9	4 9
1897 ...	4 8	4 6½	4 5¾	1918 ...	4 9	4 9	4 9
1898 ...	4 0	4 0	3 8	1919 ...	5 0	5 0	5 1½
1899 ...	2 7½	2 9	2 9	1920 ...	8 5	8 10	8 7¼
1900 ...	2 9	2 8	2 8½	1921 ...	9 0	9 0	8 8
1901 ...	2 7	2 7	2 8	1922 ...	5 2	5 11	5 8
1902 ...	3 2	3 2¾	4 5	1923 ...	5 8	5 7	5 3½
1903 ...	5 11⅝	5 9¼	5 1¾	1924 ...	4 7	4 7	5 5
1904 ...	3 0½	3 0¾	3 2	1925 ...	6 9½	6 4	6 2¼
1905 ...	3 4½	3 3⅜	3 5	1926 ...	6 0	5 9	6 2
1906 ...	3 1⅝	3 2¼	3 3½	1927 ...	5 1½	5 0¾	5 5
1907 ...	3 0⅞	3 1½	3 10	1928 ...	5 2	5 5	5 1¼
1908 ...	4 4	4 5½	4 3½	1929 ...	4 8	4 8	4 6½
1909 ...	4 0¾	4 6½	4 9	1930 ...	4 8½	4 5	3 10½
1910 ...	4 1¾	4 1	3 10	1931 ...	2 1¾	2 1¾	2 4½
				1932 ...	3 2	3 1	3 0¾

Tobacco Notes for March.

C. J. TREGENNA, Tobacco Expert.

Hints on Harvesting.

TOPPING and de-suckering are factors of importance in the production of quality tobacco. By topping is meant the removal of the top length of stalk when the flower head has started to develop.

Soon after the plants have been topped, and sometimes before, suckers will appear at the junction of the leaves and at the bottom of the stalk. As soon as they are about 2 inches long, or large enough to be conveniently grasped, these must be removed. Particular attention should be paid to this work, because if suckers are allowed to go far, the quality of the tobacco will be seriously impaired.

The "Priming" Method Favoured.

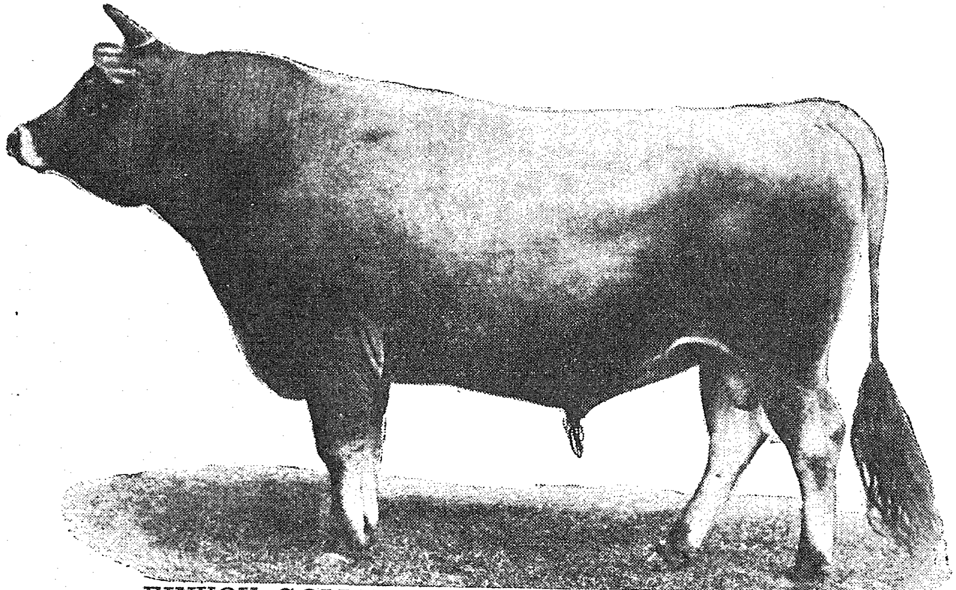
Some three to five weeks after topping, maturity will be reached. There are several methods of harvesting, but the "priming" method is the one to be generally recommended.

It will be observed that all the leaves on the plant do not ripen at the same time, but in all cases they start to mature from the bottom upwards. To secure the best results, and obtain an even cure, each leaf should be taken off separately as it reaches maturity. This, briefly, is what is meant by "priming."

The leaves are then placed in baskets or other suitable receptacles and taken straight to the barn to be strung in the shade, care being taken that after "priming" they are kept out of the sun as much as possible. The leaves are then made up into "hands" containing four in each. A 4-feet stick will take about twenty "hands," ten on each side. In each "hand" of four leaves two should face one way and two the other, the middle two having their backs together. When the tobacco is to be flue-cured, the "hands" should not be jammed up close together, but there should be a space of a few inches between each on either side of the stick.

The method of stringing it is somewhat difficult to describe. The stem-butts of each "hand" are strung with a twist of the string, to hold them together. The string, which is about twice as long as the stick, is held fast permanently at one end by being pressed into a slit in the wood, and when the required amount of tobacco has been strung, the loose end of string is run through another split at the other end, and made secure. The grower quickly finds out how it is done, after a trial or two.

Hanging may also be carried out by threading each leaf with a needle and twine through the midrib, but the process is a tedious one. Yet another method is to put fixed wires through the curing stick 7 inches apart and so that they project 5 inches on each side. The leaves can be hung on the wires by piercing through the stem-butts. Leaf so strung is very liable to damage by tearing when the stick is being handled, and it is not possible to bulk down without removing the leaves from the wires.



FINVOY GOLDEN NOBLE (Imp. N.Z., Vol. 15).

Departmental herds include the following Stud Bulls :—

Guernsey : HOPEFUL OF WOLLONGBAR (499), Champion, R. A. Show, Sydney, 1928. *Ayrshire :* SCOTTISH PRIDE OF GOWRIE PARK (3797), First and Champion, R. A. Show, Sydney, 1927; First and Reserve Champion, R. A. Show, Sydney, 1928. *Milking Shorthorn :* MORNING STAR OF DARBALARA (Vol. 8), Second, R. A. Show, Sydney, 1928. Morning Star is ex Melba 15th of Darbalara, World's champion cow of all breeds—32,522.5 lb. milk, 1,614.1 lb. butter fat in 365 days. *Jersey :* FINVOY GOLDEN NOBLE (imp. N.Z., Vol. 15).

The Department has for sale young bulls from tested dams of the following breeds :—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

Application should be made to—THE UNDER SECRETARY, Department of Agrioulture, SYDNEY

Orchard Notes.

MARCH.

C. G. SAVAGE and R. J. BENTON.

Improve the size of Coastal Citrus Fruit.

THE low returns received by citrus growers during the past two seasons has forced upon them a realisation of the fact that the utmost economy must be practised in production methods.

There is at least one direction in which improved production can be achieved without increasing expenditure, and that is by producing fruit of a better commercial size. In coastal areas too great a proportion of citrus fruits is on the small side. Satisfactory size in fruit is mainly dependent on sufficient soil moisture and a thrifty tree condition.

Green Manuring will Improve the Size.

Increasing the soil's capacity to retain moisture in established groves is possible only by increasing the organic content of the soil. In this regard Mr. Cooke's remarks on green manuring in last month's *Agricultural Gazette* are worth noting.

In green manuring trials carried out over several years and in many different types of soils purple vetch has proved a very consistent and heavy producer. During wet seasons on the coast it is much more reliable than field peas. A sowing of from 10 to 20 lb. purple vetch seed per acre is economical, especially if drilled in with 1 cwt. superphosphate. By regularly growing a green manure crop the moisture holding capacity of the soil is increased and the root feeding zone deepened, with the result that the trees are encouraged to send their roots down deeper.

Under inland conditions the tick bean is the most satisfactory green crop. Many orchardists rely on weed growth for the supply of organic matter, but this is not sufficient, as is evidenced by the fact that many trees growing under such conditions are difficult to maintain in a thrifty state.

Another factor that assists in the satisfactory development of citrus fruits is the maintenance of the leaf-bearing area of the trees. When spraying operations are delayed, heavier applications than would otherwise be necessary have to be used. Particularly in this the case where white wax scale has to be combated, for if control measures are so delayed that it becomes necessary to use larger amounts of soda or to have recourse to the use of certain spray oils, defoliation in some degree may result.

Planting and Re-working Citrus Trees.

This present month is a very suitable time for planting citrus trees in locations not subject to heavy frosts during winter. Elsewhere citrus planting in spring is recommended. Planting should only be conducted on land

which has been deeply and thoroughly prepared. When planting, ensure that the bud union is well above ground level, especially in soils which are other than very light.

March is also an excellent time for budding trees already prepared for re-working. From ten to twenty buds may be inserted according to the size of tree. About three weeks after insertion the bud-strings should be cut, and any buds that have died should be replaced. Do not force the buds into growth until the springtime, when the shoots should be cut back to within a few inches of the bud.

Oranges to Burn—But why Burn Them?

Are we to "burn" or otherwise destroy our surplus orange production of a few years hence, or are we going to get right down to work straight away and organise the industry so that when overseas markets are found we will be in a position to hold them?

The Chief Secretary (Hon. F. A. Chaffey, M.L.A.) in opening the recent interstate conference of citrus growers at Gosford, pointed out that by 1936 Australia would have a surplus of 1,000,000 bushels or oranges for which overseas markets would have to be found. The significance of the Minister's remark moved conference to appoint a committee to formulate suggestions for the better organisation of citrus growers in New South Wales, it being held that the selfishness of individuals and "cliqueishness" of some present-day citrus organisation were deterimental to the industry. Later this committee recommended that an organisation be formed on the basis of individual membership, making provision for the inclusion of packing houses and other groups of growers.

Citrus growers from the main producing districts of New South Wales, Victoria and South Australia attended this conference, the second of its kind held. The convention was organised by the Federal Citrus Council of Australia.

To Produce Quality Bananas.

Banana growers have had it forcibly demonstrated to them in recent months how much depends upon the production of quality fruit when it comes to competing for the most profitable markets.

The last two seasons have been exceptionally trying ones for the banana-grower. In that period he has experienced very droughty conditions, floods and exceptionally hot and cold weather, the winter just passed being one of the driest and coldest on record. In these unfavourable conditions lie good reasons for the quality of some of our bananas being somewhat below par, but in some instances a better understanding of the requirements of the banana plant would have resulted in better quality fruit, notwithstanding severe seasonal handicaps.

One thing that some growers fail to recognise is that they cannot grow both weeds and bananas to perfection. Banana plants will not thrive in competition with weeds, and only second-grade fruit can be expected from unthrifty plants. An economical method of getting rid of weeds is by spraying, and the best way to carry out the operation is described hereunder by Mr. H. W. Eastwood, Senior Fruit Instructor, stationed at Murwillumbah, who also supplies a useful note on the liming of banana soils.

Spraying for Weed Control in Plantations.

Many banana growers have found it more economical to spray than to chip for weed control. A poison spray containing arsenic in some form has been found most satisfactory in banana plantations. Stock solutions of these sprays are on the market and they are quite satisfactory, although more expensive than where the grower makes his own.

As arsenic is not soluble in water, either washing soda or caustic soda has to be used to dissolve it, producing sodium arsenite, which is a convenient form in which to use the spray. A useful formula for quick and effective work is:—Arsenic 1 lb., washing soda 1 lb., or caustic soda ½ lb., and water 12 gallons. First dissolve the soda in a convenient amount of water, using heat if necessary to hasten the process, then slowly add the arsenic, which has been previously made into a thin paste, stirring all the time; place over a hot fire and after it has come to the boil allow it to remain at least half an hour, stirring from time to time. When the arsenic has been thoroughly dissolved the solution may be made up to the required bulk by adding the remainder of the water.

As with other sprays, it is essential to use a "spreader" for best results. Common soap in the proportion of 4 or 5 lb. to 100 gallons of spray is commonly used. Phenol, safoma and glue, either separate or in combinations, are also used as spreaders.

This mixture will kill all soft weeds and will severely check summer grass, but will not kill it outright. Chipping is more satisfactory than spraying to eradicate heavy growth of summer grass. For hardier weeds a double strength solution of the above spray is suggested. The strength of the spray, of course, can be varied according to the grower's practical experience and the results achieved under local conditions.

A better kill of weeds is obtained by spraying on hot sunny days.

Now is the Time to Lime.

Although it has not been proved that an acid soil is detrimental to bananas, results from field trials have indicated that liming with or without the application of fertilisers is beneficial on average banana soils.

Lime has very little manurial value, but is useful as a soil amendment in improving the physical condition of the land; in particular, it loosens heavy clay soils. Lime liberates potash and renders other plant foods in the soil more available to the plants and is therefore an indirect fertiliser. It helps in the decomposition of organic matter, aids nitrification, and if applied in

sufficient quantities will counteract harmful acidity. Too heavy an application will release plant foods more quickly than is required and they are likely to be lost to the plants.

Ground limestone, or agricultural lime, which contains lime in the form of carbonate of lime, is the safest form to use and an application at the rate of one ton per acre is advisable. Larger applications can be made if the soil is very acid. It is easily applied by broadcasting evenly over the land and is most readily assimilated by the soil in this form when ground up very fine. The autumn is a suitable time for applying lime. It should not be applied to the soil at the same time as superphosphate or fertilisers containing ammonia; an interval of about six weeks should elapse between the applications of lime and fertilisers.

Burnt lime, also known as quicklime or builders' lime, and air-slacked lime (calcium hydrate) are too caustic in their action, especially the former.

Additional Fruit Cases Approved of.

THE regulations under the Fruit Cases Act have now been amended to include the following additional cases, and in the case of that for black currants to supplant the one previously prescribed:—

Case.	Inside Measurements.	Capacity.
		cub. inches.
Lemon case (one bushel)...	25 in. long by 13 in. wide by 10 in. deep (with central division).	3,250
Lemon case (one half bushel).	25 in. long by 13 in. wide by 5 in. deep (with central division).	1,625
Orange crate (two bushels)	$24\frac{3}{4}$ in. long by $13\frac{1}{2}$ in. wide by $13\frac{1}{2}$ in. deep...	$4,510\frac{11}{16}$
Cherry case	26 in. long by 5 in. wide by 6 in. deep (with central division).	780
Black currant case ...	18 in. long by $7\frac{1}{16}$ in. wide by $4\frac{1}{4}$ in. deep	$540\frac{9}{32}$

It is an offence for which a substantial penalty is provided to sell fruit in a case other than of a size specified in the regulations under the Fruit Cases Act. The word "sell" includes barter, as well as offers or attempts to sell, exposing for sale, receiving for sale, or sending, forwarding or delivering for sale.

Grasp This Opportunity for Overseas Publicity.

The Imperial Fruit Show.

THE spring apple and pear competitions in connection with the next Imperial Fruit Show are to be held at the New Horticultural Hall, Westminster, London, on 7th and 8th June next. Copies of the schedule of classes and prizes, together with the necessary entry forms, have been received by the Department, and from a perusal of the schedule it appears

that an alteration in the conditions operating in previous years has been made so far as the overseas section is concerned. This section is open to growers, associations of growers, packing houses and exporters in Australia, New Zealand and South Africa. Entries are not to be specially packed, but will be drawn at random in England from commercial consignments of reasonable size. Drawing will be done by Dominion or State official representatives in Great Britain in conjunction with a representative of the firm holding the consignment, and the packages selected will be sent forward for judging and exhibition. This alteration was made as the result of representations by authorities of the Dominions concerned, and means that it is now only necessary for exhibitors in overseas classes to authorise their agents in Great Britain to hand over appropriate packages of their fruit for exhibit purposes in the class selected by them. The authorities hope that this new arrangement in respect of the overseas section will have the effect of stimulating a larger entry than previously, and more in accordance with the combined fruit resources of the countries concerned. It is stated that with the full support of growers and the co-operation of their representatives and agents the Third Spring Show will secure valuable publicity for the fruits exhibited at the height of their season in their principal market.

The entry fee is at the rate of 10s. per entry. Two entry forms are provided in the schedule, and overseas section entries must be made in duplicate; the pink form to be forwarded to the exhibitor's agent or salesman in Great Britain so as to reach him on or before 20th May, 1933, in the case of Australian exhibits. The white form should be filled in and posted with entry fees, in the case of New South Wales exhibitors, to reach the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than 6th April, 1933, so that the Department may forward them to reach the show organisers within the prescribed time. Exhibitors also require to note particularly that exhibits must reach England in sufficient time to ensure delivery to the exhibition hall before 7th June, on which date judging will take place. Intending exhibitors are invited to communicate with the Department as early as possible to obtain copies of the schedule and entry forms wherein full particulars are given as to the conditions, prizes to be awarded, etc.

Frozen or Canned Pineapples?

AMONG the many fruits and fruit juices that have been subjected to quick freezing by the United States Department of Agriculture, pineapples have uniformly yielded products that are superior to those preserved by heating. Samples held in storage more than a year, it is reported, have retained the characteristic pineapple flavour and colour to such an extent that many who have tasted them have noted little difference from the fresh fruit. The cooked and often rather sharp acid taste of canned pineapple is absent, and the texture is firmer than that of the canned pineapples. The frozen juice also has no cooked taste and does not deteriorate like the pasteurised juice, either in colour or flavour.

Canada Buys More of our Raisins.

ACCORDING to advices from the Official Secretary for the Commonwealth in New York, great prominence is being given in the American press to the increasing demand in Canada for Australian raisins and reference is made to the fact that for the twelve months ended 31st March, 1932, Australia contributed out of a total import to Canada of 33,950,000 lb. of raisins 16,675,000 lb., as against 16,340,000 lb. from U.S.A. In the previous twelve months America supplied 25,146,000 lb. as against Australia's 10,700,000 lb.

Obviously, the idea behind the U.S.A. press references to this matter is to stir American growers to greater efforts to recover this lost Canadian trade. Australian exporters can therefore be certain of meeting keener competition in the future.

There are no Blight-proof Strains of Bean Seed.

IT has come under the notice of the Department that certain firms are offering for sale supplies of so-called "blight-proof" bean seed, whereas official tests have demonstrated that no varieties or strains of beans are blight-proof or resistant to this disease.

Bacterial blight is now known to exist in all countries in which beans are grown, and tests conducted by the Department during the past season have demonstrated that careful and systematic eradication of diseased plants will result in the production of seed practically free from disease, provided that the original seed is lightly infected and that environmental conditions do not favour rapid spread of the disease during the growing season. It is hoped that the methods now in use will result in the production of stocks of seed which are completely free from disease. While certain seed lots now on the market may be less affected than others, no "blight-proof" strains are known, and the use of this term by firms or persons selling bean seed is very misleading.

Fumigation a Valuable Factor in Rabbit Destruction.

FUMIGATION can be made quite a valuable factor in rabbit extermination. The gases chiefly employed are carbon monoxide, carbon bisulphide, and hydrocyanic acid gas. In using any gas, the most satisfactory results will undoubtedly be obtained if a suitable pump or machine is used to force the gas, or the powder from which it is generated, into the burrow.

A lot of valuable information on fumigation and other phases of rabbit destruction is contained in a pamphlet recently issued by the Department of Agriculture. Write for a copy; there is no charge. The Department's address is Box 36A, G.P.O., Sydney.

HUMBOLDT, the great German traveller and naturalist, calculated that 33 lb. wheat and 98 lb. potatoes require for their growth the same space of ground as will produce 4,000 lb. of bananas.

Poultry Notes.

March.

E. HADLINGTON, Poultry Expert.

AMONG the hundreds of people who call at the Department of Agriculture to inquire into the question of starting a poultry farm, there are few who realise how much capital is required to establish a farm which will be a lasting asset, and many, by seeking advice, have been saved from investing a few hundred hard-earned pounds in a venture which would be a hopeless one from the start. Unfortunately, however, there are probably many more who enter into the business without being aware that full information can be obtained from the Poultry Branch of the Department. There are others who purchase a farm or land, and later learn that such advice is available. Frequently in such cases an inspection shows that the farm is unsuitable, or serious mistakes have been made at the beginning which cost dearly, and in some instances lead to failure.

A popular idea amongst those contemplating taking up poultry-farming is that all one has to do is to purchase laying stock, and a living is assured at once, but their mistake is soon discovered when they look around to purchase the necessary stock. It is found that suitable laying birds cannot be bought at a price which would show a profit in the first year, because no poultry-farmer who desires to remain in the business is going to sell his hens and pullets at less than the profit he could make by keeping them. Thus, the would-be poultry-farmer is disillusioned, and has to do what other poultry-farmers do—that is, rear his own stock.

It should be realised that there is no satisfactory "short cut" in building up a flock of layers, and anyone who desires to remain in the business permanently and make it profitable, especially under present conditions, must be able to rear chickens successfully. Not only so, but to make the most out of a farm, he should have his own breeding stock and hatch the chickens from them. Certainly in cases where, on account of lack of capital, it is essential to reduce expenditure on equipment to a minimum, a saving could be made at first by purchasing chickens, but in a few years the cost of chickens would pay for the breeding and hatching equipment.

Cost of Establishing a Poultry Farm.

A few figures regarding the cost of equipping and stocking a farm for 1,000 layers may be helpful for those contemplating starting in the industry. In the first place the cost of land must be taken into account. This will vary considerably according to the locality and area. With regard to the area, it is not advisable to start on less than 5 acres, because even though it may not be intended when starting to extend beyond a "one-man farm," it is almost invariably found after a few years that such a farm entails too much drudgery, and it is desired to increase the flocks so that labour can be

employed; thus 5 acres is none too large an area—in fact, an acre or two more would be preferable. However, allowing for 5 acres with city water available and perhaps electric light, at, say, £40 per acre, the cost of building and working up a farm based on all new materials, but not including labour for erection, would work out approximately as follows:—

	£
5 acres of land	200
Materials for all poultry buildings and runs (including incubator room, feed room, and workshop, brooder house and brooders, rearing and breeding pens, colony houses, and semi-intensive houses)	500
60 breeding birds	65
Incubators	50
Tools, water supply extensions, feeding and watering utensils, etc.	50
Hatching and rearing first season's chickens (1,250) to six months of age	110
	£975

To this figure must be added the cost of a dwelling, and living expenses for two years while working up the flock. The reason for allowing two years for raising the flock is that to attempt to rear 1,000 pullets in one year would involve double the cost of hatching and rearing equipment and breeding stock, etc., and it is not a paying proposition to replace the whole flock of hens at the end of their first year's laying. Hence the practice adopted by most poultry-farmers of replacing half the stock each year. By this means 500 pullets, or a little over to make up for the losses among hens, would be raised each succeeding year, as long as it was desired to maintain a flock of 1,000 layers. During the first two years, while the flock is being built up, practically no income can be expected for living costs, as the revenue from the first 500 pullets is absorbed in raising the second 500. This is where many beginners become disheartened, because they expect that when the first season's pullets come into production they will be assured of an income, and they come to the conclusion that poultry-farming does not pay.

With the best of management and conditions it is possible in some cases to obtain sufficient income to cover living expenses at the end of eighteen months, but it is not safe to trust to this, because as the pullets come on to lay the hens are entering the moulting season, and many of the pullets will also go through a partial moult during the autumn. Therefore, one cannot be sure of consistent laying before July.

Reducing Cost of Building.

As previously stated, the estimate of cost outlined is based on using all new materials. Some reduction in expenditure may therefore be effected by those who can secure good second-hand materials at a lower cost than new, or if satisfactory bush timber is available it could be used for posts and framework, but no saplings less than 4 inches diameter after the bark has been removed should be used for placing in the ground, as the sap ring soon rots, and in the case of thinner posts leaves them weak. The best plan, however, is to char the end of the post which goes into the ground and then

treat with tar or oil. This, of course, entails a lot of work, and if labour has to be employed to cut and prepare the timber it will be more costly than sawn material.

Another direction in which expenditure may be curtailed at first is by omitting pens for the second stage of rearing, which are provided for in the estimate, and utilising the colony houses instead, but to do this it would be necessary to enclose temporarily the fronts to make them cosy until the chickens had learned to roost. Further reductions may also be made by erecting narrow sheds for layers instead of the semi-intensive houses allowed for, and extending them into semi-intensive sheds as funds permit. By these means, it may be possible to reduce the outlay by about £100. No attempt should be made, however, to economise unduly in the provision of brooding plant, as this is the most important part of a farm, and makeshift arrangements are the sure road to failure.

Table Poultry Grading.

Last month an important conference was held at the Department of Agriculture to go into the question of improving facilities for marketing table poultry and to deal with other aspects connected with methods of handling dressed poultry. At this conference committees were appointed to deal with various matters arising out of the conference. These committees have since met on several occasions and have made good progress in dealing with the various matters submitted to them. A sub-committee comprising representatives of the poulterers and the Department was appointed to deal with the question of standards and grades for the sale of dressed poultry. The sub-committee has finalised this work, and as a result the following definitions of the various classes of poultry and grades have been recommended for adoption by the conference:—

Suggested Definitions of Various Classes of Poultry.

(Weights stated are when dressed for retail sale

FOWLS.

Poussins.—Chickens 6 to 8 weeks old, of either sex, weighing less than $\frac{3}{4}$ lb.

Grillers.—Chickens 8 to 12 weeks old, of either sex, weighing $\frac{3}{4}$ lb. and not over $1\frac{1}{4}$ lb

Roasters.—Birds 3 to 8 months old, weighing over $1\frac{1}{4}$ lb., sufficiently soft-meated to be cooked tender by roasting.

Boilers.—Hens of any age or weight in which the flesh is toughened and the breast-bone is not flexible. Must have legs cut off below hocks for identification.

Stags.—Male birds over 8 months old having hardened breast-bone and toughened flesh, and showing hardened spur development. Only suitable for long boiling.

DUCKS.

Drakelings and Ducklings.—Birds 10 to 16 weeks old, according to breed, soft-fleshed, and flexible in breast-bone.

Drakes and Ducks.—Birds over 16 weeks, having toughened flesh and hardened breast-bone.

TURKEYS.

Young Gobblers.—Male birds under 1 year old, soft in flesh and not hardened in spur.

Young Hens.—Birds under 1 year old, soft in flesh.

Gobblers and Hens.—Birds over 1 year old. Must not have toes cut off for identification.

Suggested Particulars of Grades for Various Classes of Poultry.

FOWLS.

Poussins.—

1st Grade.—Chickens free from deformity or bruises, and well dressed.

2nd Grade.—Chickens showing any deformity, or that are bruised or torn in dressing.

Grillers.—

1st Grade.—Well fleshed birds, free from deformity, bruises and dressing defects.

2nd Grade.—Poorly fleshed birds, showing any deformity and slight bruises, or dressing defects.

Roasters.—

1st Grade.—Full fleshed, well dressed birds, with soft flexible breast-bone, free from deformities or bruises, and not showing any hard spur development.

2nd Grade.—Poorly fleshed birds, showing any deformity, dressing defects, having slightly hard spur development or any hardening of breast-bone, but not sufficient to be classed as "boilers" or "stags."

Boilers.—

1st Grade.—Full fleshed birds, free from deformities and dressing defects.

2nd Grade.—Poorly fleshed birds, showing any deformity or dressing defects.

Stags.—

1st Grade.—Same as for 1st grade "boilers."

2nd Grade.—Same as for 2nd grade "boilers."

DUCKS.

Drakelings and Ducklings.—

1st Grade.—Soft, full fleshed, well dressed birds, free from deformity, bruises, or darkened flesh.

2nd Grade.—Poorly fleshed birds, showing any deformity or dressing defects or slightly darkened flesh.

Drakes and Ducks.—

1st Grade.—Well fleshed birds, free from dressing defects or deformities. May be slightly dark in flesh.

2nd Grade.—Poorly fleshed birds showing any deformity or dressing defects or dark and toughened in flesh.

TURKEYS.

Young Gobblers and Young Hens.—

1st Grade.—Full fleshed, well dressed, soft meated birds, free from bruises, crooked breast or other deformities.

2nd Grade.—Poorly fleshed birds showing crooked breasts or other deformities, bruises and dressing defects.

Gobblers and Hens.—

1st Grade.—Well fleshed, well dressed birds, free from serious deformities.

2nd Grade.—Poorly fleshed birds, showing any deformity or dressing defects.

It is proposed that the class and grade of each bird be branded on the web of the wing with a rubber stamp, using blue indelible ink for first grade and red indelible ink for second grade.

OF recent years marked progress has been made in the control of insect pests by the use of parasites. The new insectary that it is proposed to erect in the Botanic Gardens will provide facilities that will enable the Department's parasitological research work to be greatly extended and carried out under conditions making for greater success. By such means as this it is hoped still further to minimise the losses experienced by primary producers.

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VOL. XLIV. PART 4. APRIL 1, 1933.

Agricultural Gazette of New South Wales.

In Search of New Wheats and Oats.

AND OF BETTER METHODS OF GROWING THEM.

A new variety of wheat or oats has to be something out of the ordinary to force its way into commercial cultivation these days, yet it is reasonable to believe—in fact it is certain—that from time to time new and better varieties will be evolved that will supersede those at present favoured. Hope that such will be the case is based on the fact that almost every year to date has seen some progress in this direction, and there is no reason to believe that the plant breeders, experimentalists and field workers will reach the end of progress in 1933. More likely is it that, as each year's experience is added to the accumulated knowledge of previous years, progress in the production of better varieties will be speeded up.

"Hasten slowly" is the motto of the Department when it comes to releasing or recommending new varieties. After an apparently superior variety has been selected or bred by the Department's workers it is tested for several seasons, at first in small plots and finally under field conditions at the Department's experiment farms, and if it survives all these tests it eventually finds its way into the experiment plots that are conducted each year on farmers' properties. By this means these new varieties are given a wider and final test, under conditions that are most convincing and above criticism, seeing that the farmer is really the experimenter. Not only are varieties tested in this way, but cultural methods, involving manuring, rate of seeding, etc., also find a place in these farmer-conducted experiments.

It would be unwise to draw definite conclusions from the results of any one year, but with the publication of all the factors—seasonal and cultural—that are likely to affect the yields, the farmer is able to dissect the published reports and estimate with some degree of exactness whether the newer varieties are worthy of a trial on his particular farm.

Nabawa, Rajah, Aussie and Canimbla.*

Consistent Yielders in the Coonabarabran-Mudgee District.

FARMERS in the Coonabarabran–Mudgee district co-operated with the Department of Agriculture in conducting wheat and oat experiment plots at the following centres:—Pilliga, Kenebri, Teridgerie, Baradine, Bugaldie, Ulimambri, Purlewaugh, Tambar Springs, Binnaway, Weetaliba, Neilrex, Mendooran, Dunedoo, Birriwa, Tallawang, Gulgong, Mudgee, and Havilah.

Rainfall Below the Average.

In every part of the district the rainfall for the year was below the average, but the excellent falls in September, ranging from 3 to 6 inches, completely changed the outlook. Fortunately the incidence of the rainfall, other than for the earliest parts of the district and for the early sown forward crops, was most favourable.

* The information under this heading is from the report of Mr. G. Nicholson, H.D.A., Senior Agricultural Instructor, on the farmers' experiment plots in his district.

Other than for scattered thunderstorms, hot and dry weather prevailed in January and February. This delayed preparation of summer fallow until March, when good rain fell. A general rain of 1½ inches in the second half of April assured germination of all April sown wheat. From April to June, seeding progressed practically without interruption and the majority of crops were seasonably sown. Moisture reserves, though low, were sufficient to promote germination other than on poorly prepared land. April to August yielded less than 6 inches of rain. May and June were abnormally dry but some relief was obtained in July. The crops faced the spring with an almost entire absence of subsoil moisture, a dry spell extending over a period of just on eight weeks from early July until the end of August seriously retarded crop growth and the early wheat suffered a permanent check.

Crops grown on heavy fertile country and those that had been grazed until early in the spring responded quickly to the September rains. Second growth was prevalent in the forward crops and delayed harvesting, while the wheat sample contained bleached and pinched grain. Rain in November came too late to materially assist the rapidly ripening crops, but did but little damage other than favour rapid development of rust in the very late crops. The weather was mainly hot and dry towards the end of November and continued until January. This was ideal harvesting weather and the bulk of the grain was of excellent quality.

The rainfall registrations at the various centres are shown in the following table:—

RAINFALL Registrations, 1932.

District and Experimenter.	Summer Fallow Period (January to March).				Crop Growing Period (April to October).							
	Jan.	Feb.	Mar.	Total.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.
	pts.	pts.	pts.	inches.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	inches.
J. Miller-Williams, Pilliga ...	63	74	237	3·74	129	180	95	67	4	218	59	7·52
Mrs. M. Worrell, Kenebri	93	71	271	4·35	142	101	135	163	72	325	78	10·16
R. Johns, Baradine ...	148	22	262	4·34	171	141	135	181	106	460	180	13·74
G. Hotchkiss, Baradine ...	160	Nil.	242	4·02	128	170	211	130	75	349	61	11·24
L. A. Hatton, Teridgerie ...	195	Nil.	256	4·51	130	122	125	200	50	343	45	10·15
E. Ferguson, Bugaldie ...	126	20	489	6·35	192	48	75	239	79	404	100	11·37
R. Young, Ulimambri ...	111	17	417	5·45	160	78	51	160	66	429	109	11·18
F. Corderoy, Purlewaugh ..	144	Nil.	286	4·30	154	33	68	150	72	341	172	9·90
A. B. Langdon, Purlewaugh	70	50	380	5·00	135	60	61	100	40	617	205	12·18
A. Brown, Weetaliba ...	54	52	626	7·32	145	98	48	145	94	327	51	9·08
T. P. Gleeson, Tambar Springs	70	Nil.	280	3·50	160	60	20	105	50	417	65	8·77
G. A. Mullins, Binnaway ...	96	Nil.	444	5·40	148	28	88	162	98	281	163	9·68
S. McClelland, Mooren ...	92	20	455	5·67	...	...	...	...	...	...	...	...
J. Rivas, Mendooran ...	20	20	348	3·88	176	45	106	186	103	373	100	10·89
F. G. Jones, Mendooran ...	32	31	257	3·20	146	45	85	151	94	380	74	9·75
A. G. Inder, Dunedoo ...	Nil.	98	338	4·36	198	55	71	140	118	380	137	10·99
L. G. Bourke, Birriwa ...	Nil.	58	307	3·65	196	55	83	137	141	459	109	11·80
Robinson Bros., Tallawang	75	100	393	5·68	243	56	73	202	130	628	101	14·33
F. H. Barrett, Gulgong ...	32	244	379	6·55	164	51	75	108	179	420	82	10·79
P. White, Havilah ...	14	157	531	7·02	305	36	107	112	161	309	155	11·85

Don't Sow Nabawa Too Early.

Nabawa, Rajah, Aussie and Canimbla have been consistently good yielders over the past three years, while Sepoy, Ford, Baringa and Bobin did well in the 1932 trials.

Nabawa is unquestionably a most adaptable wheat and fully merits the popularity it enjoys. Because of the large area devoted to Nabawa by individual growers, there is a tendency to sow a portion too early, often with disappointing results.

Aussie continues to be very productive and appears to be particularly suited to the Baradine district. It is also useful for late sowing on the lighter loams and for this purpose is superior to Waratah. On account of susceptibility to flag smut, it should be sown only on country thought to be reasonably free from infection.

Rajah, though possessing a number of undesirable features, viz., susceptibility to disease and bleaching, and weak straw, is an excellent yielder. This variety is growing in popularity.

Dundee and Canimbla, varieties producing grain of superior quality, have given satisfactory returns. At Ulimambri, Dundee gave the highest yield in 1931 and 1932.

Sepoy was outstanding at Purlewaugh and also did particularly well at two other centres where it was tried. At Purlewaugh in 1931 it outyielded other wheats by 10 bushels and in 1932 by 12 bushels.

Ford gave most satisfactory yields at practically all centres. It is a wheat that has made rapid headway; its attractive appearance will add to the popularity of this variety. A reliable wheat suitable for early and mid-season sowing is required and it appears as though Ford will fill the gap.

Baringa, though somewhat tough to thrash, stands up to dry weather conditions and is worthy of further trial. It is more suited for mid-season than early sowing.

Baroota Wonder in both the 1931 and 1932 trials was most disappointing and it is apparently totally unsuited to this district.

Free Gallipoli is variable in yield and like Bobin, though productive in suitable seasons, is not favoured on account of high susceptibility to rust.

Does Superphosphate Pay in This District?

The practice of manuring the wheat crop with superphosphate has never been widely adopted in this portion of the State, and prevailing economic conditions have resulted in a diminution of the quantity of fertiliser used. It is fortunate for the wheat-grower that satisfactory yields can be obtained without fertiliser and whilst low prices for wheat prevail, the use of superphosphate cannot be recommended in this district, except under special circumstances.

Cultural Details and Yields of Wheat Variety Trials in the Coonabarabran–Mudgee District, 1932–33.

District ...	Pilliga.	Kenebri.	Baradine.	Teridgerie.	Ulimambri.	Purlewaugh.	Weetaliba.
Experimenter ...	Miller-Williams, J.	Worrell, M. (Mrs.)	Hotchkiss, G.	Hatton, L. A.	Young, R.	Langdon, A. B.	Brown, A.
Nature of soil ...	Silty loam	Medium silty loam.	Sandy loam.	Brown medium loam.	Brown light loam.	Red volcanic friable loam.	Brown light loam.
Ploughing ...	Mould-board 4 inches April.	Late sown crop fed off in October.	Disc 3 inches January.	Disc 3½ inches January.	Disc 3 inches January.	Spring-toothed 4 inches January.	Disc 4 inches March.
Cultivation ...	Spring-toothed April; sown with cultivator drill.	Spring-tooth cultivated March; sown with combine in semi-dry seed bed.	Spring-toothed March; scarified April, again in May; sown with disc drill.	Scarified mid-March; sown with combine.	Spring-toothed March, and again in April; sown with combine.	Spring-toothed mid-March, and again in April; sown with combine.	Spring-toothed April; harrowed May; sown with combine.
Date of sowing ...	3–4 May ...	4–5 May ...	5–6 May ...	6 May ...	10 May ...	16 May ...	18–20 May.
Seed per acre ...	45 lb.	50 lb.	55 lb.	55 lb.	60 lb.	60 lb.	55 lb.
Superphosphate per acre ...	...	...	42 lb.	...	...	...	...
After treatment ...	...	Fed off until early July.	...	Fed off until end July.	Fed off until early August.	Waratah and Duri flag smutted.	Virgin green land; no consolidation.
Remarks ...	September rain too late.	...	...	...	...	...	...
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie ...	...	32 37	...	21 40	32 53	...	17 22
Baroota Wonder ...	...	25 39	22 20	16 38	...	...	17 0
Bobin	...	32 17	32 35	...	32 48	...	16 20
Burrill ...	...	...	23 30	20 27	...	...	...
Barwang ...	...	...	...	...	30 9	...	...
Canberra ...	14 7	26 33	...	...	...	...	...
Clarendon ...	...	...	...	...	...	...	...
Duri	13 20	28 56	...	18 4	30 12	22 12	...
Dundee ...	...	...	26 47	18 53	34 13	...	17 42
Free Gallipoli ...	...	...	...	...	...	...	...
Ford	10 0	33 51	29 19	20 52	31 15	...	...
Florence ...	...	18 1	...	...	...	...	...
Firbank ...	...	...	...	...	...	...	15 25
Geeralying ...	...	...	25 37	...	...	29 46	...
Gresley ...	...	...	24 36	...	...	...	15 30
Gullen ...	...	...	27 53	...	...	...	12 16
Hard Federation	16 7	...	...	...	...	...	...
Nabawa ...	12 31	32 9	34 15	20 17	32 15	29 1	21 48
Ranee	...	26 54	...	...	...	...	...
Rajah	...	30 6	...	21 46	...	...	...
Riverina ...	...	...	...	19 3	...	...	...
Waratah ...	7 15	...	...	18 47	29 16	23 58	...

CULTURAL Details and Yields of Wheat Variety Trials in the Coonabarabran–Mudgee District, 1932–33—*continued.*

District ...	Tambar Springs.	Mendooran.	Dunedoo.	Baradine.	Bugaldie.	Purlewaugh.	Mooren.
Experimenter ...	Gleeson, T.	Jones, F. G.	Inder, A. J.	Johns, R.	Ferguson, E.	Corderoy, F.	McClelland, S.
Nature of soil ...	Heavy friable clay.	Light sandy loam.	Variable heavy clay loam.	Harsh sandy loam	Variable medium loam.	Medium red loam.	Light red loam.
Ploughing ...	Disced 3 inches early January.	Disced 4 inches July.	Mouldboard 3½ inches March.	1931 crop fed off; disc 4 inches February.	Oats 1931, fed off; disc 4 inches January.	Oats 1931, fed off; disc 4 inches July.	Mouldboard 5 inches August.
Cultivation ...	Spring-toothed April; sown with combine.	Harrowed December, again in March, spring-toothed April; sown with combine.	Spring-toothed early April, harrowed mid-April; sown with combine.	Spring-toothed March; sown with disc drill.	Spring-toothed mid-March; sown with combine.	Scarified deep October, harrowed December, scarified 2½ inches inches January, spring-toothed February, scarified; sown with disc drill.	Harrowed September, disced January, spring-toothed March; sown with disc drill.
Date of sowing ...	21–22 April	17 May ...	20–21 May	14–15 April	19 April ...	19–20 April	8–9 April
Seed per acre ...	42 lb.	60 lb.	55 lb.	46 lb.	50 lb.	50 lb.	55 lb.
Superphosphate per acre ...	...	56 lb.	...	56 lb.	...	56 lb.	56 lb.
After treatment	...	Fed off until 20 June.	...	Fed off to July.	Fed off early July.	...	Fed off July.
Remarks ...	Forward early growth hayed or burnt off.	Loose smut; Canberra.	...	Affected by dry spell.	...	...	Frost damage to straw.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie ...	Cut for hay	25 1	35 5	...	...	...	...
Baroota Wonder ...	...	23 9	...	...	...	...	...
Bobin ...	...	22 57	34 29	...	...	...	33 47
Baringa ...	...	...	...	...	21 23	...	...
Barwang ...	...	...	...	...	...	...	30 20
Bredbo ...	...	...	...	...	...	...	28 29
Burrill ...	...	...	...	...	...	...	...
Canberra ...	7 6	18 59	...	...	...	...	...
Clarendon ...	16 22	...	...	...	...	31 30	36 56
Cleveland ...	...	...	...	...	...	25 6	...
Cadia ...	...	...	...	...	...	29 44	...
Canimbla ...	...	...	...	...	26 38	30 42	32 29
Carinda ...	...	...	...	17 18	...	...	...
Currawa ...	...	...	...	15 57	...	...	...
Duri ...	12 44	25 14	28 59	...	...	...	...
Dundee ...	14 26	24 57	...	...	23 14	...	30 39
Ford ...	23 16	25 15	...	15 0	26 34	25 11	...
Free Gallipoli ...	...	...	30 55	18 5	...	...	...
Geeralying ...	13 45	21 19	...	...	...	...	...
Gullen ...	15 21	...	...	...	...	28 58	28 18
Marshall's No. 3	...	...	...	12 35	29 15	...	24 49
Nabawa ...	...	...	30 58	16 40	...	...	...
Penny ...	...	...	...	13 0	...	...	...
Rajah ...	...	...	30 34	...	...	43 47	...
Sepoy ...	...	...	...	...	...	...	...
Turvey ...	...	...	...	...	...	29 0	...
Wandilla ...	...	...	...	...	...	...	...
Waratah ...	Cut for hay	22 8	27 48	...	...	29 49	34 10
Yandilla King	...	...	...	...	...	...	...

CULTURAL Details and Yields of Wheat Variety Trials in the Coonabarabran–Mudgee District, 1932–33—*continued.*

District	Binnaway.	Mendooran.	Birriwa.	Tallawang.	Gulgong.	Mudgee.
Experimenter ...	Mullins, G. A.	Rivas, J.	Bourke, L.	Robinson Bros.	Barrett and Gudgeon.	White and Loy.
Nature of soil ...	Variable medium brown loam.	Medium red loam.	Granitic light loam.	Brown light loam.	Brown silty loam.	Quartzy red loam.
Ploughing ...	Disc 4 inches January.	Disc 3 inches February.	Mouldboard 4 inches January.	Disc 5 inches September.	Disc 4½ inches early February.	Disc 4 inches early February.
Cultivation ...	Springtoothed February, again in March; sown with disc drill.	Springtoothed March; sown with combine.	Harrowed February, springtoothed late March, harrowed April; sown with hoe drill.	Springtoothed February, March, and prior to sowing; sown with disc drill.	Springtoothed March, harrowed April; sown with combine.	Springtoothed April, again in May; sown with combine.
Date of sowing ...	12–13 April...	7 April ...	26–27 April...	28–29 April...	23 May ...	24 May.
Seed per acre ...	50 lb.	54 lb.	55 lb.	60 lb.	60 lb.	65 lb.
Superphosphate per acre ...	...	...	65 lb.	84 lb.	...	56 lb.
After treatment	Fed off late June.	Fed off June	Fed off until mid-July.	...	...	...
Remarks ...	...	Severe hail damage when ripe.	...	...	Rust bad in susceptible varieties.	...
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie ...	...	...	...	...	...	38 50
Bobin	...	...	...	...	31 1	...
Baringa ...	...	...	...	37 24	...	...
Barwang ...	23 1	...	...	34 5	...	...
Bredbo ...	...	...	...	32 50	...	...
Burrill ...	...	...	...	36 29	...	...
Cleveland ...	...	...	28 42	...	...	...
Cadia	22 46	16 5	26 38	...	...	...
Canimbla ...	...	17 12	30 51	...	...	...
Carinda ...	...	...	25 46	...	...	...
Currawa ...	24 7	18 49	...	...	...	...
Duri	...	...	...	...	33 13	41 3
Dundee ...	...	...	...	...	...	...
Ford	25 26	18 38	26 18	...	37 36	...
Free Gallipoli ...	22 30	...	24 7	...	38 2	46 43
Geeralying ...	...	...	...	...	...	41 49
Marshall's No. 3	...	15 33	27 19	...	...	...
Nabawa ...	24 35	...	...	...	33 28	44 41
Penny ...	21 49	17 58	25 55	...	...	...
Rajah	...	...	...	...	35 36	46 29
Sepoy	...	19 9	...	36 10	...	...
Turvey ...	21 43	...	...	...	...	...
Wandilla ...	...	17 0	...	...	...	...
Waratah ...	...	...	...	...	33 31	43 34
Yandilla King...	...	...	26 32	41 18	...	...

In order to obtain further information on the subject simple manurial trials were conducted at seventeen centres. The results cannot be regarded as conclusive though increases ranging from less than a bushel to the satisfactory increase of 12¼ bushels were obtained in all but four centres. Except in those cases where the crop had been fed off heavily or sown late, the season favoured the no manure areas. Manuring induced vigorous early growth, and thus these crops were well advanced by September and did not benefit from the spring rains to the same extent as the more backward crops. Midseason- to late-sown manured areas gave satisfactory increases. The decrease of nearly 4 bushels at Purlewaugh was due to forward growth and also to the fact that the superphosphate promoted a vigorous growth of wild mustard, which was almost entirely absent in the no manure plots. At Mudgee, where climatic conditions are different to the more northerly part of the district, an increase of 12¼ bushels from 56 lb. superphosphate on land that had grown only two previous crops, is noteworthy. The average increase for the past three years at two centres in the Baradine district is 2½ bushels per acre.

CULTURAL Details* and Yields of Wheat Manurial Trials, 1932–33.

District... ...	Kenebri.	Baradine.	Baradine.	Teridgerie.	Ulimambri.	Purlewaugh.*	Purlewaugh.	Purlewaugh.	Weetaliba.
Experimenter ...	Worrell, M.	Johns, R.	Hotchkiss, G.	Hatton, L. A.	Young, R.	Redden, M. B.	Corderoy, F.	Langdon, A. B.	Brown, A.
Date of sowing	4 May.	14 April.	5 May.	6 May.	10 May.	11 May.	19 April.	16 May.	18 May.
Seed per acre ...	50 lb.	46 lb.	55 lb.	55 lb.	60 lb.	55 lb.	46 lb.	60 lb.	57 lb.
Variety ...	Nabawa.	Nabawa.	Nabawa.	Waratah.	Nabawa.	Nabawa.	Marshall's No. 3.	Nabawa.	Nabawa.
Fertiliser per acre—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
No manure ...	32 9	17 36	31 56	18 47	32 15	20 26	32 41	29 1	21 48
Superphosphate—									
42 lb. ...	...	...	34 15	...	...	...	...	...	20 53
56 lb. ...	34 0	16 40	...	21 52	33 8	25 3	28 58	32 55	...
112 lb. ...	...	...	...	...	...	23 49	...	35 29	...
Increase ...	1 51	...	2 19	3 5	0 53	4 37	...	3 54	...
Decrease ... from 42 lb. or 56 lb. superphosphate.	...	0 56	...	...	...	...	3 43	...	0 55

District... ...	Mooren.	Mendooran.	Mendooran.*	Dunedoo.	Birriwa.	Tallawang.	Mudgee.	Gulgong.
Experimenter ...	McClelland, S.	Rivas, J.	Jones, F. G.	Inder, A. J.	Bourke, L. G.	Robinson Bros.	White, P., and Loy.	Barrett & Gudgeon.
Date of sowing	8 April.	7 April.	17 May.	20 May.	26 April.	28 April.	24 May.	23 May.
Seed per acre ...	55 lb.	54 lb.	60 lb.	55 lb.	55 lb.	60 lb.	65 lb.	60 lb.
Remarks ...	...	Hail damage.	Fed off ...	...	...	...	...	...
Variety ...	Yandilla King.	Marshall's No. 3.	Nabawa.	Waratah.	Marshall's No. 3.	Yandilla King.	Waratah.	Waratah.
Fertiliser per acre—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
No manure ...	28 48	15 33	27 53	27 48	30 27	40 2	31 19	33 31
Superphosphate—								
56 lb. ...	34 10	16 56	...	28 54	27 19	...	43 34	38 19
84 lb. ...	...	...	28 5	...	...	41 18	...	...
112 lb. ...	...	...	...	...	...	...	46 31	...
Increase ...	5 22	1 23	0 12	1 6	...	1 16	12 15	4 38
Decrease ... from 56 lb. or 84 lb. superphosphate.	...	...	...	...	3 8	...	...	...

* The cultural details were the same as for the wheat variety trials, except at Purlewaugh (M. B. Redden) and Mendooran (F. G. Jones), where they were as follows :—

Purlewaugh (M. B. Redden).—Soil, red medium loam; disced 3 inches February, springtoothed April and May; sown with disc drill.

Mendooran (F. G. Jones).—Soil, chocolate heavy loam; disced 4 inches March, harrowed April; sown with combine.

The Influence of a Nitrogenous Fertiliser.

Mr. F. G. Jones, of Mendooran, again conducted a manurial trial to ascertain the value of applications of a nitrogenous fertiliser in combination with superphosphate, to wheat grown on stubble land. As the yields indicate no satisfactory results were obtained, though it is considered that the season militated against any possible increase in yield.

Fertiliser.	bus.	lb.
No manure ...	27	53
84 lb. superphosphate ...	28	5
73 ,, P11 (6 parts superphosphate, 1 part sulphate of ammonia) ...	27	45
112 ,, P15 (3 ,, ,, 1 ,, ,, ,,) ...	27	57
126 ,, M16 (2 ,, ,, 1 ,, ,, ,,) ...	27	59

How Much Seed Per Acre?

Although the condition of the seed beds at Purlewaugh and Binnaway was not entirely favourable for germination, in every instance the moderate rate of seeding gave an average increase of 1½ bus. per acre. On the heavier soils, in particular, heavy seeding was a distinct disadvantage.

The results of the rate of seeding trials conducted were as follows:—

Rate of Seeding.	Bugaldie, E. Ferguson; Marshall's No. 3.	Purlewaugh, M. B. Redden; Nabawa.	Binnaway, G. A. Mullins; Nabawa.
	bus. lb.	bus. lb.	bus. lb.
65 lb. to 70 lb.	27 52	23 25	22 55
45 lb to 50 lb.	29 15	25 3	24 35
Increase from light seeding	1 23	1 38	1 40

Foot-rot and Flag Smut Increasing.

Foot-rot, flag smut and loose smut were more in evidence than for some years past; foot-rot is definitely on the increase. Probably as a large area was sown in a semi-dry seed bed this provided favourable conditions for the development of foot-rot and flag smut. The appearance of ball smut in some crops should act as a warning to growers not to fail to pickle. Although leaf spot was prevalent during early stages of growth, it did not appear to affect the productivity of the wheat. Stem rust was prevalent in late second growth and caused the grain to pinch. For resistance Ford was outstanding, which is one reason why at Tambar Springs it yielded 7 bushels more than the next best variety.

Foot-rot was prevalent in all varieties, and Ford which is reputed to have some degree of resistance, was badly affected. The value of oats in rotation for the control of the disease was demonstrated at Tallawang. In 1931 the paddock was sown to oats, with the exception of a narrow strip (running at right angles to the plots) which was sown with wheat. Infection was heavy on this strip whereas the balance of the paddock was practically free.

The importance of growing only flag smut resistant varieties on country known to be infected was emphasised by the yields recorded at "Mt. Warwick," Purlewaugh. The comparative low yield of Duri and Waratah was due to a heavy infection of flag smut, whereas Nabawa and Geeralying were free from disease.

Loose smut was very much in evidence and was a definite yield reducing factor. Practically all varieties suffered but the disease was most marked in Canberra, Rajah, Sepoy, Free Gallipoli, Duri and Aussie.

Frost damage though not so severe as in the past two seasons affected early varieties sown out of season. Oats suffered more than wheat.

CULTURAL Details and Yields of Oat Variety Trials in the Coonabarabran–Mudgee District, 1932–33.

District ...	Baradine.	Bugaldie.	Purlewaugh.	Weetaliba.	Tambar Springs.	Mooren.	Birriwa.	Gulgong.
Experimenter ...	Bunner, C.	Ferguson, E.	Burness, A.	Brown, A.	Press, F.	McClelland, S.	Grainger, F. H.	Barrett and Gudgen.
Nature of soil ...	Brown medium loam.	Brown silty loam.	Sandy to light loam.	Same as for wheat plots.	Red medium loam.	Light sandy loam.	Brown granitic loam.	Silty loam.
Ploughing ...	Scarified 2½ inches February.	Disc 4 inches January.	Mouldboard 3½ inches March.	,, ...	Disc 3½ inches February.	Same as for wheat	Disc 3 inches February.	Same as for wheat plots.
Cultivation ...	Spring-toothed March and again in April; sown with disc drill.	Spring-toothed mid-March; sown with combine.	Harrowed April; sown with combine.	,, ...	Spring-toothed April; sown with combine.	,, ...	Harrowed March; sown with combine.	,,
Date of sowing ...	2–3 May...	15 April...	20 April...	18 May ...	20 April...	8 April...	4 April...	23 May
Seed per acre	55 lb.	50 lb.	47 lb.	55 lb.	50 lb.	50 lb.	50 lb.	58 lb.
After treatment ...	...	Fed off ...	Fed off until early July.	...	Fed off lightly.	Grazed heavily.	Grazed to mid-July.	...
Remarks ...	Belar and Guyra protracted ripening.	Faulty germination.	...	...	Straw frosted.	...	...	Rust in Belar.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian ...	...	22 11	37 33	...	...	...	67 31	...
Belar	40 21	18 10	35 30	...	36 15	33 37	71 4	47 29
Buddah ...	44 33	...	...	...	24 23	26 30	...	...
Gidgee	...	...	30 8	...	29 17	...	55 32	...
Guyra	40 13	15 6	37 35	...	40 13	31 23	69 34	...
College Algerian	...	...	37 11	...	...	...	73 23	...
Laggan ...	40 5	...	...	28 34	...	...	...	...
Lachlan ...	...	...	35 15	...	...	...	...	...
Mulga	45 1	...	...	29 10	21 14	25 18	54 17	31 7
Sunrise ...	...	...	...	23 13	...	...	...	...
Palestine ...	53 35	...	...	28 16	19 7	...	...	...

Oats for All Purposes.

As the value of the earlier maturing oat varieties is gradually being recognised by landholders, the practice of sowing oats primarily for winter grazing is on the increase. Observations made during the past season, as regards palatability of the various varieties for feeding off purposes indicate that stock show a marked preference for Mulga and Buddah, and Belar is next in favour. Stock do not relish Algerian. The stubble of Mulga, Buddah and Palestine is readily eaten. The fallacy that stock prefer wheat to oats for grazing is not borne out by actual experience. In two instances where wheat and oats were grown in the one paddock sheep refused to leave the oats until eaten bare, and on one property two oat varieties were practically eaten out.

At Birriwa, where some outstanding yields were obtained, the oats sown early in April were grazed from 14th to 24th May and again from 1st to 13th June, and for the period carried at the rate of eight sheep per acre. The area was further grazed at the rate of one sheep per acre until 18th July. The oats at Tallawang though not fed off until the prolific growth was seriously damaged by the heavy mid-June frosts, carried for the six months (April to September) equivalent to 3·8 sheep per acre.

College Algerian, under test for the first time, made a favourable showing, but is considered to be too slow in maturing.

Guyra and Belar again yielded well, but, notably at Baradine and Gulgong, stem rust delayed harvesting, resulting in a heavy loss of grain. For general purpose varieties in other than the earliest parts of the district they are favoured in preference to either Mulga or Algerian.

Palestine is drought resistant and gave the highest yield at Baradine, but failed at Tambar Springs. It is essentially a grain variety, and unless sown late is highly susceptible to frost damage.

Hay Variety Trial.

The yields in a hay trial conducted by Mr. H. O. Woolley, of Mudgee, were as follows:—

	t.	cwt.	qr.	lb.
Guyra	2	9	1	26
Belar	2	5	2	25
Gidgee	2	3	2	3
Mulga	2	2	0	0
Buddah	1	18	0	13

Yields of 40 Bushels on the Western Limits of the Wheat Belt.*

THOUGH the total falls of rain during the fallow and growing periods approximated the district averages, the monthly incidence differed widely from normal. A detailed description of the season in this part of the State was given on page 208 of the March issue of the *Gazette,* and readers are referred thereto.

The following table shows the rainfall at the various centres :—

RAINFALL TABLE.

Month.	Parkes Average.	Parkes Post Office.	S. J. Plowman, Parkes.	B. Tomkins, Tichborne.	Bogan Gate Post Office.	A. Heinrich, Ootha.	J. Maynard, Trundle.	Stanley Bros., Tottenham.	G. W. Shreeve, Peak Hill.
	Points.	Points.	Points.	Points.	Points.	Points.	Points.	Points.	Points.
Fallow Period : June, 1931–*March,* 1932.									
June ...	237	434	345	365	324	237	...	262	406
July ...	187	141	124	197	177	92	...	83	240
August ...	187	55	85	48	28	23	...	Nil.	34
September ..	170	145	132	129	120	154	...	83	96
October ...	154	67	45	73	50	40	...	12	80
November...	142	224	210	196	144	80	...	84	126
December ...	190	332	323	252	251	232	...	347	269
January ...	210	Nil.	9	Nil.	16	Nil.	...	38	18
February ...	142	49	15	11	29	73	...	30	121
March ...	168	361	358	341	576	428	...	245	239
Total ...	17·87	18·08	16·46	16·12	17·15	13·59	...	11·84	16·29
Growing Period : April–October, 1932.									
April ...	146	306	404	280	262	183	155	181	219
May ...	159	35	48	38	67	95	83	135	99
June ...	237	152	86	108	94	68	56	57	107
July ...	187	169	110	226	144	98	146	80	123
August ...	187	175	104	178	202	263	175	81	189
September ..	170	175	168	241	296	476	245	278	234
October ...	154	103	120	82	95	125	154	53	126
Total ...	12·40	11·15	10·44	11·53	11·60	13·08	10·14	8·65	10·97
Grand Total ...	30·27	29·23	26·90	27·65	28·75	26·67	...	20·49	27·26

* Summary of the report by Mr. H. Bartlett, H.D.A., Senior Agricultural Instructor, on the farmers' experiment plots in the Western District (Parkes Centre).

CULTURAL Details and Yields of Wheat Variety Trials, Western (Parkes centre) District, 1932–33.

District	Albert.	Tottenham.	Trundle.	Condobolin.	Condobolin.	Ootha.	Peak Hill.
Experimenter ...	Bakes, E. R.	Stanley Bros.	Maynard, J.	Treloar, A. E. C.	Westcott, M.	Heinrich, A.	Shreeve, G. W.
Nature of soil ...	Red loam, 18 ins. deep.	Heavy loam, 6 ins. deep.	Red loam, 12 ins. deep.	Red loam, 21 ins. deep.	Red loam, 18–21 ins. deep; new land.	Red loam, 24 ins. deep.	Heavy loam, 4 ins. deep.
Ploughing ...	Sundercut August, 1931.	Mouldboard August, 1931.	Not ploughed.	Sundercut August, 1931.	Fallowed for 1931 crop; not ploughed.	Sundercut August, 1931.	Sundercut September, 1930.
Cultivation ...	Sundercut September, combined December and January, sundercut February, combined March, combine sown.	Combined March, 1932, combine sown.	Scarified August, 1931, combined January, 1932, combined March, combine sown.	Combined October, combine sown.	Combined February, 1932, combined March, springtooth cultivated April, drill sown.	Scarified April, combined April, drill sown.	Springtooth cultivated January, 1931, sundercut August, sundercut January, 1932, combined March combined late March, combined May (two years fallow), combine sown.
Date of sowing ...	20 April.	21 April.	22 April.	26 April.	27 April.	28 April.	5 May.
Seed per acre ...	48 lb.	47 lb.	60 lb.	50 lb.	45 lb.	50 lb.	50 lb.
Superphosphate per acre ...	60 lb.	37 lb.	60 lb.	50 lb.	50 lb.	50 lb.	56 lb.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Waratah ...	27 0	35 44	19 15	17 33	16 45	...	40 7
Nabawa ...	41 30	40 16	21 55	20 9	21 33	29 39	44 29
Bobin ...	39 28	41 8	22 41	22 34	18 35	29 50	45 8
Ford ...	40 45	38 29	18 24	15 20	20 43	30 11	48 30
Rajah ...	37 3	40 27	24 50	23 6	...	33 11	...
Geeralying ...	26 20	...	...	...	13 56	...	...
Riverina ...	...	39 18	19 29	19 0	17 42	...	38 9
Gullen ...	...	29 42	...	17 6	...	...	...
Dundee ...	...	...	23 58	...	17 49	...	...
Gluyas Early ...	...	...	...	...	...	26 42	...
Duri ...	...	...	...	...	...	24 2	...
Ranee ...	...	...	...	...	...	29 34	...
Burrill ...	...	...	...	...	...	...	46 42

Nabawa and Bobin Outstanding.

The plot yields were exceptionally high in some localities, five exceeding 40 bushels per acre. The yields from the Tottenham and Albert districts are worthy of special mention, as the plots were located upon the supposed limit of the wheat belt. The rainfall at Tottenham as registered by the grower, was only 11·84 inches during the fallow period, and 8·65 inches during the growing period. Such results may largely be attributed to fallow, timely seeding of suitable varieties, and the use of superphosphate.

The past year's results, from the plots, and also the crop competitions, have consolidated the positions of Nabawa and Bobin. Both have produced

CULTURAL Details and Yields of Wheat Variety Trials, Western (Parkes centre) District, 1932–33—*continued.*

District	Wirrinya.	Tichborne.	Nelungaloo.	Forbes.	Coradgery.	Parkes.	Alectown.	Mandagery.
Experimenter ...	Hastings, K. H.	Tomkins, B.	Nicholls, F.	McKay, C.	Tanswell, W.	Plowman, S. J.	Patton, F.	Cameron, D.
Nature of soil ...	Red loam, 12 ins. deep.	Black clay loam, self-mulching.	Red loam, 9 ins. deep.	Black clay loam, self-mulching.	Red loam, 6 ins. deep.	Black clay loam, self-mulching.	Heavy loam, quartz gravel.	Red loam, 9 ins. deep.
Ploughing ...	Sundercut March, 1931.	Mouldboard September, 1931.	Mouldboard September, 1931.	Disc-ploughed September, 1930.	Disc-ploughed August, 1931.	Mouldboard July, 1931.	Mouldboard July, 1931.	Sundercut October, 1931.
Cultivation ...	Sundercut March, 1932, harrowed April, combine sown.	Harrowed March, 1932, spring-tooth cultivated May, combine sown.	Harrowed March, 1932, combined early April, combine sown.	Scarified February, 1931, combined April, sundercut November, scarified twice April, 1932, harrowed April (two years' fallow), combine sown.	Sundercut January, 1932, scarified May, drill sown.	Disc-cultivated January, disc-cultivated March, spring-tooth cultivated early April, combine sown.	Combined September, disc-cultivated January, 1932, combined February, harrowed March, combine sown.	Combined early April, 1932, combine sown.
Date of sowing ...	9 May	3 May.	23 April.	30 April.	9 May.	25 April.	26 April.	18 April.
Seed per acre ...	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.	45 lb.	60 lb.	69 lb.
Superphosphate per acre ...	56 lb.	50 lb.	55 lb.	45 lb.	50 lb.	55 lb.	Nil.	62 lb.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Waratah	17 33	...	...	34 8	34 13	42 27	...	...
Nabawa	19 14	...	27 22	38 37	32 20	...	...	16 3
Bobin	21 12	...	...	41 7	31 45	49 6	...	...
Ford	14 28	29 17	32 6	43 34	36 15	...	...	17 15
Rajah	20 27	...	...	34 35	...	40 32	...	...
Geeralying ...	...	...	...	...	...	43 5	...	...
Riverina	...	...	...	30 44	...	...	...	...
Dundee	15 54	26 55	30 36	...	...	...	25 18	17 15
Burrill	...	27 29	...	...	37 58	...	30 41	19 36
Exquisite ...	...	22 55	27 3	...	...	...	26 28	16 44
Federation ...	...	23 30	19 32	...	...	...	22 29	16 6
Free Gallipoli ...	...	33 52	...	...	...	...	22 40	...
Union	...	30 30	26 10	...	...	...	20 2	...
Bena	...	21 1	21 26	...	26 26	...	23 29	...
Baringa	...	...	31 35	...	...	...	...	...
Bredbo	...	...	26 14	...	...	...	...	...
Koongi	...	...	...	...	...	40 25	24 33	...
Yandilla King ...	...	...	...	...	...	...	...	13 55
Duchess	...	...	...	...	...	40 48	...	...

some very high yields, and their behaviour has been consistently good, without any partiality to the western locality. The same may be said of Ford, and its usefulness for the earlier seeding in the western parts of the district may be looked to with some confidence. Its position, however, may well be challenged by the variety Burrill, a wheat produced by Mr. S. J. Plowman, of Parkes. In all material factors of appearance and habit it resembles Ford, and is an even better hay wheat. It is not subject to flag smut or to rust. Ford withstood the dry winter and early spring as well as any of the varieties under trial, but the satisfactory September rains precluded any observations of drought resistance being made.

CULTURAL Details and Yields of Wheat Fertiliser Trial in the Western (Parkes centre) District, 1932–33.

District	Cookamidgera.	Peak Hill.	Nelungaloo.	Gunningbland.
Experimenter ...	Hawken, J. N.	Shreeve, G. W.	Bassett, R. C.	Mill, G. F.
Nature of soil ...	Silty loam ...	Heavy loam, 6 ins. deep.	Silty loam, 9 ins. deep.	Black clay loam, self-mulching.
Ploughing	Sundercut July, 1931.	Sundercut September, 1930.	Mouldboard August, 1931.	Mouldboard August, 1931.
Cultivation	Scarified October, sundercut February, 1932, scarified May, combine sown.	Springtooth cultivated January, 1931, sundercut August, sundercut January, 1932, combined March, combined late March, combined May (two years' fallow), combine sown.	Harrowed November, sundercut January, harrowed March, springtooth cultivated March, combine sown.	Combined March, combined twice April, combine sown.
Date of sowing ...	7 May.	5 May.	2 May.	4 May.
Seed per acre ...	60 lb.	50 lb.	58 lb.	52 lb.
Varieties	Bobin.	Waratah.	Waratah.	Nabawa.
Fertiliser per acre—	bus. lb.	bus. lb.	bus. lb.	bus. lb.
No manure ...	31 11	35 45	31 53	48 23
Superphosphate—				
28 lb. ...	36 51	......	......	......
42 lb. ...	37 15	......	......	......
56 lb. ...	37 15	40 7	35 36	45 7
84 lb. ...	35 33	......	32 57	45 7
112 lb. ...	......	......	34 45	49 37
168 lb. ...	......	......	......	51 21
224 lb. ...	......	......	......	49 47

For some years Rajah has quietly and steadily been asserting itself upon the lighter soils of the western localities, and is now attracting notice within the eastern areas (Parkes). It has given the highest average yield over the past five years at Ootha, and has now yielded over 40 bushels at Tottenham and 37 bushels at Albert. It is of medium height, square headed, moderately susceptible to flag smut under field conditions, and tends towards excessive flagginess if grown upon heavy rich soils.

Geeralying, while possessing some desirable characteristics, has the objectionable feature of shedding. Dundee, while not prominent in the plot yields, has given satisfaction in the few commercial areas which were seeded, and an increase in its area is expected. Its flag smut resistance, mid-season maturity, short, stout, straw, and grain quality make it particularly desirable.

Exquisite has failed to produce a satisfactory quality of grain, due to pinching, while Baringa this season proved quite easy to thresh, in contrast to the experience of 1931, when, after the harvest rains it was impossible to free the grains sufficiently to make a commercial sample.

Superphosphate Gives a 9-Bushel Increase.

The favourable season of 1931 had enabled satisfactory crops to be produced without the use of superphosphate, and as it appeared advisable to keep the influence of the fertiliser before the farmer, the no manure plot, which had in previous years been eliminated, was reinstated in all trials. Even though

the 1932 season was a favourable one for unmanured crops, the results of the plots show a very definite increase of from 3½ to 9 bushels per acre due to the application of a moderate quantity of superphosphate.

Is a Nitrogenous Fertiliser Necessary?

An experiment to determine the effect of nitrogen in the form of sulphate of ammonia, applied at the time of sowing and also as a top-dressing during the early spring, upon a wheat crop, was conducted in conjunction with Mr. W. Watson, of "Woodbine," Tichborne.

The soil is a silty loam 12 inches deep. The plot was mouldboard ploughed in mid-August, 1931, springtoothed October and February, and sown with a combine on 3rd May, using 64 lb. per acre of Nabawa wheat. The top-dressing with 42 lb. sulphate of ammonia took place on 25th August, 1932.

The plot treatments and harvest results were as follows :—

Fertiliser.	*Yield per acre.* bus.	lb.
Superphosphate, 84 lb. per acre	42	00
Superphosphate, 84 lb. per acre, plus a top-dressing of 42 lb. sulphate of ammonia	37	35
No manure	35	38
*M17, 126 lb. per acre	39	45
*M17, 126 lb. per acre, plus a top-dressing of 42 lb. sulphate of ammonia ...	41	52
No manure	36	35
Sulphate of ammonia, 42 lb. per acre	36	19
No manure, plus a top-dressing of 42 lb. sulphate of ammonia	35	23

*M17 fertiliser consists of two parts superphosphate and one part sulphate of ammonia.

During the growth of the plots there was a marked improvement due to the use of superphosphate, and slight improvement due to sulphate of ammonia. At harvest time (2nd December, 1932) the plot receiving sulphate of ammonia at seeding, and the one which had no superphosphate, but which was top-dressed, appeared equal, but were taller and more dense than the no-manure plot. The yields, however, were not quite as good.

The use of 84 lb. of superphosphate increased the yield by 6 bushels over the unmanured plots.

The use of sulphate of ammonia depressed the yields, but such a result must be considered with relation to the soil, seasonal conditions, and the past history of the paddock.

Palestine Oats for Grain.

The most notable feature of the oat trials was the consistency of Palestine as a grain producer. Its short straw makes it less liable to lodge than the taller sorts. Belar is still gaining in favour in place of Mulga.

Cultural Details and Yields of Oat Variety Trials in the Western (Parkes centre) District, 1932–33.

District ...	Ootha.	Alex-town.	Bogan Gate.	Trundle.	Man-dagery.	Gunning-bland.	Albert.	Cooka-midgera.
Experimenter ...	Buckland, C. W.	Unger, A. P.	Broderick, M.	Bush, H.	Pearce, J.	Scrivener, A.	Martin, J.	Tolhurst, W.
Nature of soil ...	Red loam, 15 inches deep.	Chocolate clay loam.	Red loam, 8 inches deep.	Chocolate loam, 12 inches deep.	Red loam, 9 inches deep.	Chocolate clay loam, mulching.	Light loam, 12 inches deep.	Sandy loam.
Ploughing ...	Mouldboard, September, 1931.	Sundercut March, 1932.	Mouldboard August, 1931.	Mouldboard August, 1931.	Not ploughed	Sundercut August, 1931.	Disc ploughed April, 1932.	Mouldboard July, 1931.
Cultivation ...	Springtooth cultivated March, 1932, and again in April, drill sown.	Scarified April, combine sown.	Combined October, combined January, harrowed March, combine sown.	Combined September, combined April, combine sown.	Disc cultivated January 1931, disc cultivated October, combined April, combine sown.	Springtooth cultivated December and April, combined May, combine sown.	....	Springtooth cultivated August, mouldboard ploughed November, springtooth cultivated March.
Date of sowing ...	25 April...	27 April...	25 April...	3 May ...	29 April...	1 June ...	2 May ...	20 April
Seed per acre lb....	50	40	60	45	48	40	40	45
Superphosphate per acre lb. ...	40	45	50	33	70	45	Nil.	30
Varieties—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Mulga	42 29	33 32	50 32	22 3	44 17	53 33	21 20	...
Belar	44 17	36 34	40 34	32 16	37 16	46 8	14 35	34 6
Palestine ...	28 26	46 39	47 32	41 18	62 31	...	22 16	33 13
Guyra	44 35	18 24	53 36	32 23	46 26	55 26	21 13	29 6
Algerian ...	...	19 30	...	...	37 28	52 13	...	...
Myall	40 26	...	...	...	...	...	...	...
Lachlan ...	...	...	...	...	...	...	...	27 3

Dundee Stands Out in the Central-Western District Trials.*

An Excellent Season.

The season in this district was probably the best on record, judging from the standard of the crops and the high yields obtained. It was not, however, without its anxious periods, but fortunately rain eventuated before irreparable damage was done. The first of these was at sowing time during May, which month was one of the driest ever recorded, and a satisfactory germination seemed doubtful. However, rain fell in early June, and a good germination was secured. In mid-September, for want of rain the plants began to spindle, and, in the western section of the district, to come into ear prematurely. This situation was relieved by excellent heavy and general falls which assured satisfactory yields.

* The details under this heading are from the report of Mr. W. D. Kerle, H.D.A., Senior Agricultural Instructor for the Central-Western District.

RAINFALL Table.

	Wattamondara (C. Pengilly).	Wynnefield (F. L. B. Corke).	Eugowra (F. Mulligan).	Greenethorpe (A. N. Freebairn).	Tyagong (Maroney Bros.).	Billimari (F. Harding).	Cranbury (S. E. Nash).	Molong (C. W. Reid).	Tyagong (Joyce Bros.).	Mogongong (W. Griffin)	Gambara (G. Davidson).	Grenfell (O. G. Blayney).	Billimari (G. Gray).	Wattamondara (E. T. Walker).	Lockwood (H. H. McDonald.)	Canowindra (H. A. Traves).	Iandra (L. E. Smith).	Pinecliffe (G. Bradley and Son).	Belabula (W. B. Farley and J. Mobbs).	Tyagong (Freudenstein Bros.).
Fallowing Period.																				
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
1931.																				
July	155	163	161	170	228	208	156	119	184	277	172	182	172	146	134	175	211	137	180	218
August	124	112	78	122	152	180	95	30	80	131	122	146	94	110	43	105	162	61	77	143
September	132	157	171	187	148	162	189	177	131	167	214	135	156	171	184	146	168	166	188	51
October	124	116	98	114	114	127	95	56	77	99	154	102	109	147	75	90	111	49	57	122
November	141	144	30	212	212	133	188	170	180	243	230	197	117	120	143	173	183	224	114	224
December	437	389	265	296	234	377	253	312	259	268	333	250	382	449	256	306	283	308	382	284
1932.																				
January	...	5	...	...	...	6	...	35	...	...	...	...	...	...	...	...	...	36	...	...
February	44	92	15	77	63	105	56	62	56	50	34	52	119	36	30	115	56	16	103	75
March	251	239	274	295	228	224	338	465	313	248	265	298	245	327	495	279	223	337	243	200
Total	1,408	1,417	1,092	1,473	1,379	1,522	1,370	1,426	1,280	1,483	1,524	1,362	1,394	1,506	1,360	1,389	1,397	1,334	1,344	1,317
Growing Period.																				
April	191	273	245	217	329	257	341	198	190	350	243	258	222	231	343	236	221	202	241	275
May	50	65	40	44	66	44	42	21	72	71	51	73	51	50	60	67	50	31	61	72
June	162	192	117	123	145	233	158	141	142	118	138	127	212	134	163	185	184	125	204	173
July	161	135	177	171	192	155	143	147	186	180	193	190	177	148	100	145	183	127	155	201
August	164	167	157	183	138	175	181	174	202	92	220	216	119	185	266	176	180	157	146	206
September	150	306	282	253	272	355	258	337	170	234	329	117	287	217	270	232	195	231	220	237
October	19	72	174	118	128	138	81	192	19	95	103	43	56	60	127	92	62	178	99	66
November	301	313	189	186	283	218	240	245	208	192	236	208	274	193	240	360	219	222	342	306
Total	1,198	1,523	1,381	1,295	1,553	1,575	1,444	1,455	1,189	1,332	1,513	1,232	1,398	1,218	1,569	1,493	1,294	1,273	1,468	1,536

During October further useful falls were responsible for maintaining rapid growth, and by the end of that month the early-sown crops, which were then in ear, were very dense, tall and luxuriant, and in some cases lodging. Unfortunately for these crops, very heavy rain fell in mid-November, causing them to lodge badly. This rain, however, greatly benefited the late-sown crops, which were eventually very little behind the early ones in yield.

The fallow period for these crops was all that could be desired, the initial ploughing having been done under good conditions, and excellent spring and early summer rains experienced. January and February were also ideal in that practically no rain fell, and there was an absence of heavy storms which are a distinct disadvantage in these months on the undulating wheat lands of the central west (which comprise probably 80 per cent. of the total area) where soil erosion and guttering are becoming such a serious problem. Rain during these months also induces the growth of weeds, particularly stink grass, so that maintaining good fallows is a matter of frequent cultivations or the employment of disc implements. Provided the surface soil is mulched, therefore, dry weather in January and February, such as experienced this season, is very desirable.

Autumn rains fell very opportunely for preparing the ground for sowing, which work took place under ideal conditions in April and early May. Following the dry period in May, winter rains were light, but sufficient to maintain steady growth until the September rains mentioned above arrived.

The accompanying table shows the rainfall recorded by the experimenters in their localities.

Long Straw is a Disadvantage.

The season was one in which all varieties gave very satisfactory yields, and it probably favoured those whose yielding capacity is only limited by disease susceptibility. As the season was particularly unfavourable to disease, flag smut and rust in particular, these varieties were not handicapped and gave exceptional yields.

Probably the most important angle from which varieties may be viewed this season is their length of straw and tendency to lodge. The season favoured rapid growth from spring to maturity and the length of straw was, in many instances, 5 to 6 feet and over. While it is true that modern harvesting machinery can deal satisfactorily with badly lodged crops, apart from the fact that they are much more expensive to handle from a labour and time point of view, the grain quality invariably suffers, and should heavy and continuous rain set in rust would probably attack the greener crops, while the straw would rot in ripe crops and would not comb up. Other things being equal, therefore, shortness of straw is a decided acquisition to a variety.

It would appear also that varieties with long straw do not stand up to dry conditions or a dry period as well as those with short straw, and it is possible that the dry period in September was chiefly responsible for the

CULTURAL Details and Yields of Wheat Variety Trials in the Central-Western District, 1932–33.

District	Tyagong.	Cowra.	Billimari.	Eugowra.	Wattamondara.	Billimari.	Lockwood.	Mogongong.
Experimenter ...	Freudenstein Bros.	Corke, F. L. B.	Gray, G. A.	Mulligan, F.	Walker, E. T.	Harding, F. W.	McDonald, H. H.	Griffin, W. F.
Nature of soil ...	Medium red loam.	Medium to heavy clay loam.	Medium red loam.	Medium red loam.	Strong red loam.	Medium red loam.	Strong red loam.	Light red loam.
Ploughing ...	Mouldboard, 4 in., end July.	Mouldboard, 4½ in., August.	Mouldboard, 4½ in., September.	Disc-ploughed, 4 in., September.	Disc-ploughed, 4½ in., August.	Mouldboard ploughed, 4½ in., September.	Disc-ploughed September.	Mouldboard ploughed, 4 in., August.
Cultivation ...	Rigid-tined October and end January, harrowed March, rigid-tined April and in May prior to sowing with drill.	Harrowed and disc-cultivated February, harrowed March and spring-toothed prior to drill sowing.	Harrowed February, disc-cultivated early March, rigid-tined end March; sown with rigid-tine combine and harrowed.	Spring-toothed January and February; combine sown and harrowed.	Disc-cultivated January, harrowed March, rigid-tined early April; combine sown and harrowed.	Harrowed January, spring-toothed February, March, and in front of drill.	Spring-toothed February, twice in March, and prior to drill sowing.	Harrowed March, spring-toothed early April and end April and prior to drill sowing.
Date of sowing ...	9 and 10 May.	13 and 21 April.	20 and 27 April.	29 and 30 April.	22 April.	22 April, 3 May.	24 April.	9 and 10 May.
Seed per acre ...	60 lb.	65 lb.	60 lb.	58 lb.	60 lb.	58 lb.	60 lb.	55 lb.
Superphosphate per acre ...	65 lb.	68 lb.	60 lb.	70 lb.	60 lb.	60 lb.	70 lb.	70 lb.
Remarks	...	...	...	...	...	...	Lodged badly.	...
Late Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Burrill	...	...	...	33 27	...	...	...	39 50
Canimbla ...	...	34 13	...	...	...	29 27	...	...
Carinda	...	...	...	...	...	26 30	...	...
Penny	...	33 16	...	...	38 58	...	33 41	...
Sepoy	...	33 4	...	...	...	...	...	...
Turvey	...	...	...	...	34 11	...	30 38	...
*Yandilla King ...	...	34 42	...	...	33 10	29 37	34 4	34 49
Midseason Varieties.								
Baringa	...	...	27 35	33 14	...	...	34 57	36 26
Bena	...	...	...	...	33 3	...	...	...
Duchess	...	...	...	26 2	...	...	...	...
Dundee	45 17	38 56	28 26	31 5	...	...	29 22	37 14
Ford	35 36	35 14	25 34	27 8	28 45	...	28 40	40 36
Free Gallipoli ...	...	...	...	24 57	...	...	...	...
*Nabawa ...	35 37	33 34	26 14	30 11	29 51	...	30 13	38 2
Ranee	36 23	...	...	...	...	...	...	...
Early Varieties.								
Bobin	...	...	...	...	...	36 43	...	...
Duri	35 36	...	25 9	...	...	32 48	...	39 3
Geeralying ...	32 14	...	23 30	...	...	...	...	33 24
Rajah	...	...	...	...	...	33 24	...	...
Riverina	...	...	26 49	...	...	...	...	...
*Waratah ...	32 44	...	24 44	...	...	35 21	...	33 18

* Standard variety for comparison.

CULTURAL Details and Yields of Wheat Variety Trials in the Central-Western District, 1932–33—*continued.*

District	Quandong.	Eugowra.	Canowindra.	Wattamendara.	Molong.	Grenfell.	Grenfell.	Greenethorpe.
Experimenter ...	Nealon, H.	Mulligan, J. E.	Traves, H. A., and Bros.	Pengilly, Chas.	Reid, C. W., and Son.	Blayney, O. G.	Carter, Jas.	McKay, A. J.
Nature of soil ...	Light red to grey loam.	Medium red loam.	Light red loam.	Medium red loam.	Strong red loam.	Strong red loam.	Medium red loam.	Medium to strong red loam.
Ploughing ..	Mouldboard ploughed November.	Disc-ploughed, 4½ in., July.	Mouldboard, 4 in., September.	Disc-ploughed, 4½ in., December, 1930.	Mouldboard ploughed September, 4½ in.	Mouldboard, 4 in., August.	Mouldboard, 4 in., August.	Mouldboard, 4 in., August.
Cultivation ...	Spring-toothed February, and combine sown and harrowed.	Disc-cultivated January, spring-toothed February, early April and prior to combine sowing.	Harrowed November, spring-toothed end January; combine sown.	Spring-toothed January, February and March, 1931, rigid-tined July and November, and in March, 1932; combine sown and harrowed.	Spring-toothed and harrowed early December and March, harrowed early April, spring-toothed end April; combine sown.	Rigid-tined March, harrowed April; combine sown.	Harrowed September, spring-toothed January and prior to drill sowing.	Harrowed November, spring-toothed February; combine sown and harrowed week later.
Date of sowing ...	30 April, and 2 May.	10 May.	5 May.	28 April, (midseason varieties), 18 May (early varieties).	2 and 11 May.	12 May.	3 May.	9 and 10 May.
Seed per acre ...	60 lb.	60 lb.	60 lb.	56–60 lb.	58 lb.	65 lb.	62 lb.	60 lb.
Superphosphate per acre ...	60 lb.	70 lb.	65 lb.	80 lb.	70 lb.	55 lb.	65 lb.	75 lb.
Remarks	...	...	...	...	Lodged badly.	...	...	...
Late Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Burrill	...	...	...	30 4	30 2	...	...	34 37
Canimbla ...	36 32	...	...	...	39 54	...	...	...
Carinda	32 45	...	...	...	...	...	...	...
Marshall's No. 3	35 47	...	...	...	...	...	...	...
Penny	37 3	...	...	...	...	...	...	...
Sepoy	40 30	...	...	...	...	35 31	...	...
*Yandilla King ...	35 58	...	...	...	...	...	...	...
Midseason Varieties.								
Dundee	36 31	...	...	30 17	42 34	...	...	...
Ford	36 30	...	21 48	28 9	37 50	...	...	32 34
Free Gallipoli ...	...	...	...	29 41	...	...	...	...
*Nabawa ...	...	...	24 17	19 30	33 44	...	...	32 23
Ranee	...	23 45	...	...	...	...	24 15	...
Early Varieties.								
Aussie	...	...	...	...	...	25 35	...	...
Bobin	37 0	...	26 31	23 0	...	29 0	29 23	38 36
Canberra	...	...	...	19 31	...	...	...	...
Duri	...	27 43	22 48	22 31	...	27 39	25 30	...
Geeralying ...	...	22 0	...	18 34	...	...	22 45	...
Gullen	...	31 50	...	...	...	...	21 9	...
Rajah	...	...	21 24	...	...	...	29 32	39 12
Riverina	...	...	...	...	...	...	...	...
*Waratah ...	...	29 38	21 30	23 7	32 21	24 4	26 0	31 40

* Standard variety for comparison.

CULTURAL Details and Yields of Wheat Variety Trials in the Central-Western District, 1932–33—*continued.*

District ...	Greenethorpe	Pinecliff.	Canowindra.	Eugowra	Cranbury.	Tyagong.	Carcoar.
Experimenter ...	Freebairn, A. N.	Bradley, G., and Son.	Farley, W. B.	Pengilly, A.	Loomes, H.	Maroney Bros.	Burns, Wm.
Nature of soil ...	Light red loam.	Light red loam.	Strong red loam.	Light loam.	Light red loam.	Strong red loam.	Light grey loam.
Ploughing ...	Mouldboard, 4½ in., August.	Disc-ploughed March, 4½ in.	Mouldboard, 5 in., July.	Disc-ploughed November, 4 in.	Mouldboard, 4½ in., end August.	Disc-ploughed, 4 in., September.	Mouldboard, 4½ in., October.
Cultivation ...	Disc-cultivated February, springtoothed mid-March, and in front of drill.	Harrowed and spring-toothed April; combine-sown and harrowed.	Disc-cultivated November, springtoothed March and May prior to drilling.	Rigid-tined January, and again beginning April; combine sown and harrowed.	Harrowed November, disc-cultivated end February, harrowed end March, rigid-tined prior to combine sowing.	Harrowed January, and early March, rigid-tined and harrowed end April; drill sown.	Reploughed end February, harrowed twice April; combine sown.
Date of sowing ...	28 April.	6 May (midseason varieties). 23 June (early varieties).	12 and 13 May.	28 April.	28 April.	5 May.	3 and 4 May.
Seed per acre ...	70 lb.	60–65 lb.	55 lb.	60 lb.	65 lb.	61 lb.	58 lb
Superphosphate per acre ...	70 lb.	70 lb.	49 lb.	60 lb.	56 lb.	50 lb.	65 lb.
Remarks ...	Slightly damaged by hail.	...	Badly lodged; late harvested.	...	...	...	Slight loss due to shedding.
Late Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Burrill ...	26 30	...	...	...	...	...	...
Canimbla ...	...	...	...	...	...	25 40	20 0
Carinda ...	...	...	...	...	...	...	19 13
Marshall's No. 3 ..	...	...	...	33 13	...	...	...
Penny ...	...	...	...	...	...	29 22	...
Sepoy ...	...	...	...	27 43	...	...	...
Turvey ...	...	...	...	...	...	27 16	...
Wandilla ...	...	...	...	27 36	...	...	...
*Yandilla King ...	...	...	...	27 57	...	32 34	24 28
Midseason Varieties.							
Baringa ...	...	27 8	...	...	...	...	...
Bredbo ...	...	...	...	...	...	27 0	...
Duchess ...	24 30	...	...	...	...	...	...
Dundee ...	24 21	...	...	33 2	...	33 15	...
Ford ...	22 12	26 12	...	27 10	...	30 10	26 38
Free Gallipoli ...	27 57	...	...	...	...	...	...
*Nabawa ...	26 45	26 34	28 38	34 16	...	...	27 3
Early Varieties.							
Aussie ...	...	...	...	...	31 50	...	...
Bobin ...	...	28 28	32 30	...	36 39	...	...
Canberra ...	...	18 55	28 22	...	...	...	...
Duri ...	...	19 34	29 42	...	33 17	...	...
Geeralying ...	...	...	...	...	32 54	...	...
Riverina ...	...	...	...	...	32 0	...	...
*Waratah ...	...	21 50	35 40	...	33 34	...	...

* Standard variety for comparison.

decrease in yield of the tall growing and popular Ford variety. Evidence of this is supplied from the yields at Mogongong (W. F. Griffin), and Carcoar (Wm. Burns), where the soils are light and the positions rather low lying, and where the shortage of moisture at this time was hardly noticed.

With regard to lodging, therefore, it is apparent from the season's experiments that the majority of the popular wheats to-day (chiefly Nabawa, Ford, Waratah, Yandilla King, Riverina, and Turvey) have this disadvantage. Normally the growth of such varieties as Marshall's No. 3, Bobin, Canimbla, Bena, Canberra, and Duri is not sufficiently tall to cause bad lodging, but they have all indicated this season, in the slower growing section of the district, that when they exceed their normal height, they will also lodge badly. Outstanding varieties this season in strength of straw have been Dundee, Sepoy, Rajah, Baringa, Duchess, and Free Gallipoli, all of which have given exceptionally fine yields.

Dundee Yields Over 45 Bushels at Grenfell.

The most conspicuous variety in the trials this year was undoubtedly Dundee. At all centres it gave excellent yields and tried at twelve centres headed the list six times, only being beaten by Ford once. It was twice outyielded by Baringa and once by Nabawa, Free Gallipoli and Sepoy for first place. In comparison with the standard midseason variety, Nabawa, it outyielded that variety in six out of ten trials. It gave the highest individual yield, viz., 45 bushels 17 lb., in the Grenfell district.

Ford did not yield up to expectations. It was not well headed and had an excessive length of straw. In comparison with the standard Nabawa at fifteen centres, it was outyielded by that variety at ten.

Nabawa behaved excellently and retrieved much of the ground it lost last year through its inability to withstand wet conditions. With regard to other midseason varieties, the season suited the older varieties such as Bena, Duchess, and Free Gallipoli; all of which outyielded Dundee at each of three centres. Baringa, of the newer varieties, although showing a bad tip, indicating frost damage, probably inherited from its parent Bomen, showed considerable promise and tried at five centres gave the highest yield of midseason varieties at three, and was not far behind at the others.

In the late maturing varieties there was little variation, Yandilla King holding its place as a standard, being defeated chiefly by Sepoy at one centre—this variety promising very well wherever tested. Carinda which grows very tall did not impress and is rather tough to thresh. Burrill showed its Warden parentage in length and weakness of straw, but showed distinct promise from a yielding point of view and is worthy of further trial.

Bobin was the highest yielding early maturing variety, and tested at nine centres outyielded Waratah, the standard, at seven, and was superior to Duri, which has been giving excellent yields in recent years, in each of eight trials.

Waratah, tried at thirteen localities, only twice headed the yields, first place being filled by Bobin at five centres, Duri and Rajah at two, and Gullen and Riverina at one. It was superior to Duri at seven out of twelve trials. The strain of Waratah used in the trials for the last two years is approximately ten days earlier than the old Waratah. This was a disadvantage this year as it headed at some centres during the dry spring period—noticeably at Grenfell (O. G. Blayney).

Use Superphosphate, but Apply it Intelligently.

It is evident from the results of these trials and those of the last few years that the best quantity of superphosphate to apply to wheat is so much a matter of season and soil that it cannot be determined within narrow limits. In the 1930 season, for example, heavy quantities were the most satisfactory, in 1931 considerably lighter applications proved the most economical, while this season, although the indications are that amounts exceeding ½ cwt. per acre are advisable, it is by no means consistent. It is evident that farmers must be guided chiefly by the class of soil, the condition of the fallow and

CULTURAL Details and Yields of Wheat Manurial Trials in the Central-western District, 1932–33.

District ...	Iandra.	Grenfell.	Cranbury.	Greenethorpe.	Canowindra.
Experimenter ...	L. E. Smith.	J. T. Hawick.	S. E. Nash.	G. Davidson.	J. E. Mobbs.
Nature of soil ...	Medium red loam.	Light red loam	Medium red loam.	Medium red loam.	Strong red loam.
Ploughing ...	Mouldboard, 4 ins., July.	Mouldboard, 4 ins., August.	Mouldboard, 4½ ins., October.	Mouldboard, 4½ ins., August	Disc-ploughed, 4 ins., February.
Cultivation ...	Harrowed end September, rigid-tined November and March, harrowed April, rigid-tined early May; combine sown.	Springtoothed March and early May; combine sown.	Harrowed March, springtoothed early April and prior to combine sowing.	Disc-cultivated February and April; combine sown and harrowed.	Harrowed February and prior to drill sowing.
Date of sowing ...	11 May.	23 May.	17 May.	20 May.	23 May.
Seed per acre ...	60 lb.	60 lb.	70 lb.	60 lb.	60 lb.
Variety ...	Waratah.	Waratah.	Duri.	Bobin.	Waratah.
Fertiliser (per acre)—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Superphosphate, 35 lb. ...	30 29	...	...	...	...
,, 56 ,, ...	...	21 9	36 38	39 2	...
,, 65 ,, ...	33 17	...	...	...	...
,, 70 ,, ...	...	23 32	31 25	...	...
,, 84 ,, ...	...	22 52	...	43 45	22 56
,, 95 ,, ...	34 49	...	...	...	...
,, 112 ,, ...	...	...	...	44 21	...
*P11, 96 ,, ...	...	...	...	...	23 4
†P15, 112 ,, ...	...	...	...	...	24 4
‡M17, 126 ,, ...	...	...	...	...	22 54
No manure ...	...	...	...	...	21 24

* P11 mixture consists of six parts superphosphate and one part sulphate of ammonia.

† P15 mixture consists of three parts superphosphate and one part sulphate of ammonia.

‡ M17 mixture consists of two parts superphosphate and one part sulphate of ammonia.

the probable season, and apply amounts which in the light to medium red loams of the central-west are in the vicinity of 60 to 75 lb. per acre. Very little variation in yield was obtained in the trial with nitrogen applied to stubble land.

Heavy Seedings are Unnecessary.

A rate-of-seeding trial was sown by Messrs. Barr Bros., Tyagong, Grenfell, on an even, level, light red loam soil. The land which had been under cultivation for twenty years and was previously cropped with wheat, had been springtoothed in March, rigid-tined August and end September, springtoothed March, harrowed twice in April, and springtoothed prior to sowing with the combine on 23rd May. Superphosphate was applied at the rate of 68 lb. per acre. Duri was the variety sown and the yields were as follows:—

Rate of seeding per acre	Yield per acre. bus.	lb.
50 lb.	30	56
60 lb.	29	51
70 lb.	31	33

These results show a greater variation than in the previous two seasons' trials, both of which showed very uniform results and very little variation due to changes in seed quantities. The averages for the three seasons, the amounts of seed applied varying a little, indicate yields of 23 bushels 24 lb., 23 bushels 9 lb., and 23 bushels 20 lb. for light, medium and heavy seeding respectively. They at least indicate that heavy quantities of seed, such as 75 to 85 lb., frequently met with, are not necessary in wheat sown at the right time on the average wheat soil of the central-west.

Foot-rot is a Menace in the Central-west.

A certain amount of damage was again occasioned by frost in low-lying areas, particularly in the Molong district.

The most prevalent diseases were foot-rot and take-all, while loose smut was more prevalent than last year, particularly at Eugowra. Flag smut was not general but several localised attacks were severe in susceptible varieties.

Foot-rot is undoubtedly the greatest disease menace in wheat in this district as it would appear that it is not brought about by any particular weather conditions, is not wholly controlled by fallowing and good cultivation, and no varieties have shown immunity or particular resistance to this disease.

Palestine Oats the Best Yielder.

It was an excellent season for growing oats and the absence of winds and rain at maturity permitted harvesting without loss. In some instances lodging was fairly bad, but little loss in yield resulted. Exceptionally heavy

CULTURAL Details and Yields of Oat Variety Trials in the Central-western District, 1932–33.

District	Billimari.	Quondong.	Mogongong.	Tyagong.	Garra.
Experimenter ...	G. A. Gray.	H. Nealon.	W. Griffin.	Joyce Bros.	E. N. Brooks.
Nature of soil ...	Medium red loam	Light red to grey loam.	Light red loam ...	Red sandy loam	Light red loam.
Ploughing ...	Disc cultivated 4 inches February.	Mouldboard 4 inches November.	Disc cultivated March.	Mouldboard March and harrowed.	Mouldboard 4 inches early March.
Cultivation ...	Springtoothed March; combine sown and harrowed.	Springtoothed February; combine sown and harrowed.	Again just prior to drill sowing.	Rigid-tined and harrowed prior to drill sowing.	Disc cultivated late April prior to combine sowing.
Previous crop ...	Wheat, 1931.	Wheat, 1930.	Wheat, 1931.	Wheat, 1930.	Wheat, 1931.
Date of sowing ...	15 April.	28 April.	22 April.	5 May.	29 April.
Seed per acre ...	40 lb.	50 lb.	40 lb.	52 lb.	50 lb.
Superphosphate per acre ...	60 lb.	60 lb.	60 lb.	60 lb.	70 lb.
After treatment ...	Fed off until mid-August.	Nil.	Nil.	Nil.	Nil.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian ...	38 26	......	......	70 0	38 26
Belar ...	36 34	54 8	52 9	66 36	41 27
Buddah ...	34 20	......	......	67 0	......
Burke ...	......	......	......	......	......
College Algerian	......	......	......	74 20	......
Fulghum ...	......	49 16	......	......	......
Gidgee ...	32 25	50 0	48 15	......	35 30
Guyra ...	......	......	49 32	......	36 15
Kendall ...	......	......	50 26	......	......
Lachlan ...	46 30	......	......	73 14	45 0
Laggan ...	......	......	......	......	......
Myall ...	......	......	......	73 26	......
Mulga ...	32 3	59 30	52 34	66 26	34 26
Palestine ...	......	......	......	86 0	43 8

CULTURAL Details and Yields of Oat Variety Trials in the Central-western District, 1932–33—*continued.*

District	Eugowra.	Canowindra.	Toogong.	Eugowra.
Experimenter	J. Mulligan.	H. A. Traves.	Allen Nash.	A. Pengilly.
Nature of soil	Medium red loam ...	Light red loam ...	Medium red loam ...	Light red loam.
Ploughing	Disc 4½ inches July	Mouldboard 4½ inches September.	Mouldboard 4½ inches early September.	Disc ploughed 4 inches November.
Cultivation	Disced January, springtoothed February, early April and prior to combine sowing.	Harrowed November, springtoothed end January, and combine sown.	Harrowed early March, springtoothed mid-March; and combine sown and harrowed.	Rigid-tined January and early April; combine sown and harrowed.
Previous crop ...	Wheat, 1930.	Wheat, 1930.	Wheat, 1930.	Wheat, 1930.
Date of sowing	27 April.	6 May.	27 April.	29 April.
Seed per acre	45 lb.	50 lb.	50 lb.	55 lb.
Superphosphate per acre	70 lb.	65 lb.	65 lb.	60 lb.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	....	....	49 5	....
Belar	43 2	46 18	56 31	58 12
Buddah	48 35	....	....	....
Burke	....	....	....	60 16
College Algerian ...	....	....	....	....
Fulghum	....	....	....	....
Gidgee	....	....	53 13	....
Guyra	....	....	47 19	....
Kendall	....	....	....	....
Lachlan	38 36	....	....	....
Laggan	....	....	48 15	....
Myall	....	....	....	....
Mulga	....	38 23	56 30	55 7
Palestine	57 0	39 7	....	69 25

yields were therefore registered, particularly at Tyagong. Palestine was the most outstanding as regards yield being the heaviest at three centres out of five and yielding 86 bushels in the Grenfell district.

Belar was again very successful and Lachlan conspicuous at two centres, one of which was a feeding-off trial to show the recovery power of varieties, Lachlan being very prominent in this regard, the next best being Algerian and Belar, while the early Mulga and Gidgee varieties evidenced very poor recovery indeed. Burke and Kendall, two new oats in these trials showed distinct promise.

Closing Date for Applications for Assistance to Wheatgrowers.

Applications for assistance from the Rural Industries Branch in connection with cropping operations will not be accepted after 15th May next. In view of the notice given, farmers should have no difficulty in submitting their applications before the date mentioned.

In the past applications which have been received late have resulted in supplies being granted when the sowing season has been practically completed. This has involved the farmer in very grave risk, and the provision of Government funds for the sowing of crops is not justified where such risks exist.

While the closing date has been fixed at 15th May, the Minister for Agriculture strongly urges that farmers should submit their applications with as little delay as possible.

Early or Late Wheats for the Bathurst District ?

Trials to determine whether early or late wheats are best suited to the Bathurst district were again carried out last season at Bathurst Experiment Farm by Mr. G. T. Dawson, Experimentalist.

The results confirm those of the previous year, Waratah (representing early varieties) proving superior to Cleveland (representing late varieties), irrespective of the time of sowing. Although mid-season sowing favoured Cleveland, its yield, even for that sowing, did not equal that of Waratah.

Numerous heavy frosts occurred in October, and 3.2 deg. of frost were recorded on 5th November, 1932, but these did not affect grain setting of Waratah, although very forward in growth at the time.

How Much Salt for a 60-ton Stack of Straw ?

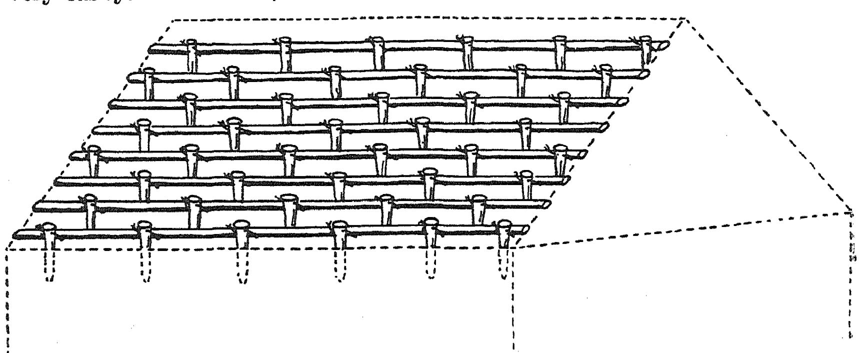
The above question was recently asked by a Narrandera farmer, who also inquired as to whether it would be advisable to use molasses, making a liquid out of the salt, molasses and water.

The Department's reply was to the effect that about 3 cwt. coarse salt would be required for a 60-ton stack. Each layer of straw should be lightly sprinkled with the salt. It was also pointed out that it was not necessary to use molasses, and that it would be most inadvisable to apply salt and molasses in liquid form, as there would be a danger of mould developing in the moistened straw.

A Novel Method of Thatching a Haystack.

PROVED EXCELLENT BY MR. H. S. MIDDLETON, PURLEWAH, WERRIS CREEK.

WHEN a man with a lifetime's experience as a farmer says that some new idea is the best ever, it is time for other farmers to take notice. And that, in effect, is what Mr. Middleton, of Purlewah, Werris Creek, said about the novel method of haystack thatching herein described. He tried it out on his farm last year and it withstood one of the severest windstorms the district has ever experienced. That alone should be sufficient recommendation, but the method has other good points, according to Mr. Middleton. It is a quicker way of doing the job than most other methods, and, furthermore, in case of accidental damage the thatch can be renewed or repaired very easily.



The First Stage. Saplings Held in Position by Pegs.

How it is Done.

Cut a quantity of thin saplings (the thinner the better, within reason) and as long as possible. The next requirement is a number of pegs about 3 feet long and 2 inches thick, with a hole bored through the top of each. Place the poles along the roof of the stack, spacing them about 18 inches apart, or at whatever spacing best suits the length of the thatching sheaves that are to be used. The poles are held in position with the pegs, which are driven in about every 5 feet along the lower side of the lines of poles. Wire together with No. 10 wire.

Now everything is in readiness for the actual thatching. Commence with the bottom row and put on five sheaves, placing another thin sapling on top of these and immediately above the one pegged to the roof of the stack. Wire the two poles together with thin wire in between, say, every five sheaves. The subsequent rows are laid in a similar manner, each row overlapping the one below it.

The sheaves used for thatching should be cut with the binder, and they should be made as large as the machine will allow.

Cane Growing on the Richmond.

Report of the 1932 Competitions.

L. S. HARRISON, Special Agricultural Instructor.

Competitions were again carried out in 1932 on the Richmond River, embracing one-year and two-year crops. The results of the one-year section are given hereunder.

With one exception the entries were all Q. 813. The exception, Oramboo, by its undoubted excellence in P.O.C.S., tied for first place. It is interesting to note in this connection that Oramboo also gained first place this year on the Clarence in the two-year competition. To give the scale of points a

Crop of Cane on the Richmond.

better balance, under the heading "For Commercial Value of Crop" in the one-year competition the basis of calculation was raised from 2 to 3 points. In the case of three competitors it was necessary to take a small mill test on account of the crop being allowed to stand over. It will be noticed that the margin of points between the nine entries received was very small.

It has been pointed out before that adequate drainage is an essential, and it is recognised as such by all careful growers. It is particularly satisfactory also to note that five competitors planted leguminous crops prior

to the cane. Certainly one or two failed, but that such a high percentage of the competitors realised the value of this procedure is encouraging. Of the balance one was on new land.

A close study of the details, as given hereunder, of soil preparation and cultivation as well as the methods employed after planting will be found worth while. Heavy hilling is to be deprecated and ploughing away should not be overdone. Many of the points made in last year's report, particularly the references to green manuring and the growing of maize between crops, could be read again with advantage, as being applicable to this year's competition.

It is important to note that, in the case of each of the first seven entries, the land had been under cultivation a minimum of ten years. An examination of details, keeping this point in mind, indicates little advantage in the use of new land, provided the old cultivated land has had the necessary attention.

Methods Employed by Leading Competitors.

P. McDonald.—This land had been under cultivation for many years and for the last fourteen has been planted to cane. Cowpeas were planted prior to this crop, but they were much reduced in value owing to floods. The land was first ploughed in August and was later harrowed, reploughed and harrowed. Planting took place early in November with a machine in 8-inch drills with a 6-inch cover. Rows were 4½ feet apart and sets were dropped every 18 inches. After planting, the land was scarified three times and chipped.

J. T. Rodgers.—This land had been under cultivation for seventeen years. The previous crop was cane, after which cowpeas were planted, but they practically failed. The trash was ploughed in, in November, after which the land was reploughed in April, disc harrowed, ploughed again, harrowed, disc harrowed, reploughed and harrowed, having been subsoiled early in October, 1931. Planting took place at the end of October in rows 4½ feet apart with sets every 18 inches in 7-inch drills with a 3½-inch cover. The land was then rolled, ploughed away twice and raked off, scuffled six times, hilled and scuffled, hilled and middled.

H. W. Graham.—This land had been under cultivation for twelve years, oats and field peas being planted in the autumn of the year following the last cane cut. It was mole drained and ploughed in July, then disc cultivated and harrowed twice. Planting took place at the end of November with a machine in 6-inch drills with a 2-inch cover. Rows were 4½ feet apart and sets were dropped every foot. After planting, it was ploughed away and scuffled four times. One cwt. of sulphate of ammonia to the acre was applied in the middle of February.

A. W. Rippon.—This land had been under cultivation ten years, two years having elapsed since the cane was ploughed out. The first ploughing took place in June, after which it was rotary hoed twice, reploughed, rotary hoed, harrowed twice, reploughed and rotary hoed. Planting (with a machine) took place early in September, sets being dropped in 7-inch

drills with a 3-inch cover. Rows were 4 feet 9 inches apart with continuous sets. After planting, the land was ploughed away then raked off, scuffled down, centres split and cultivated three times.

AWARDS in The Richmond River Cane-growing Competition, 1932.

Competitor.	Cultivation (Max. 20 points).	Evenness and lack of patchiness. (Max. 20 points).	Stooling (Max. 10 points).	Freedom from Disease (Max. 15 points).	Freedom from Lodging (Max. 5 points).	Points for Commercial Value of Crop.	Estimated Tonnage per acre.	P.O.C.S.	Total Points.	Variety.
P. McDonald	18½	17	8½	15	5	9	22	13·7	73	Q. 813
J. T. Rodgers	19½	17½	8½	14½	5	8	17	14·7*	73	Oramboo
H. W. Graham	18	16½	8½	15	5	8	24	12·5	71	Q. 813
A. W. Rippon	18	16	8½	15	5	8	25	11·9	70½	Q. 813
B. S. and R. H. Sneesby	18½	17	8	14½	5	6	18	12·2	69	Q. 813
R. Dann	18	15½	7½	15	5	7	17	13·7	68	Q. 813
R. Durrington	17	16	8	15	5	4	12	12·2*	65	Q. 813
A. E. Ellis	17½	15	7½	15	5	4	12	12·9*	64	Q. 813
B. Plenkovitch	18	14	6½	15	5	5	12	13·7	63½	Q. 813

* Determined by small mill analyses.

STORE HONEY AT 40 DEGREES FAHR.

TESTS carried out in U.S.A. show that honey stored at 40 deg. Fahr. keeps in good condition for an indefinite period of years. In experiments conducted by H. F. Wilson and G. E. Marvin at the University of Wisconsin, sixteen samples of honep were stored at four different temperatures, namely, 40, 60, 80, and 100 deg. Fahr. Some of the honey came from wholly unsealed or from partly capped combs, other samples from completely sealed combs. Moisture tests and colour gradings were made for each sample.

"These tests show that honey preserved at 40 deg. Fahr. remains in virtually perfect condition indefinitely," report Wilson and Marvin. "In the 60 deg. Fahr. chamber all but two of the samples fermented in less than one year, regardless of whether they were taken from partially sealed or completely sealed combs. In the 80 deg. Fahr. chamber, the samples extracted from completely sealed combs indicated no fermentation at the end of two years, while samples from partially sealed combs were all fermented at the end of that period. Samples in the 100 deg. Fahr. chamber did not ferment, but this temperature is entirely too high for storage for the sugar decomposes and produces a scorched flavour."

Laboratory tests showed that yeasts and their spores that cause honey fermentation were present in all the honey samples. It was found that these yeasts do not grow at temperatures below 50 deg. Fahr., but that they will grow at temperatures from 55 to 80 deg. They are most active between 60 and 70 deg. At 80 deg. or more, changes in the colour of the honey increase and its flavour is injured, tasting as if it had been burned. Apparently, concludes the report, apiarists will do well to store their honey at a temperature of 50 deg. or less if it is to be kept for one or two years.

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ALBERT MILLS
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SOUTH BRISBANE

The Manager,
Dunlop-Perdriau Rubber Co. Ltd
B R I S B A N E.

27th July 1932.

Dear Sir,

It occurred to me that a few words in appreciation of the wonderful service your Perdriau Tyres have given me would not be out of place.

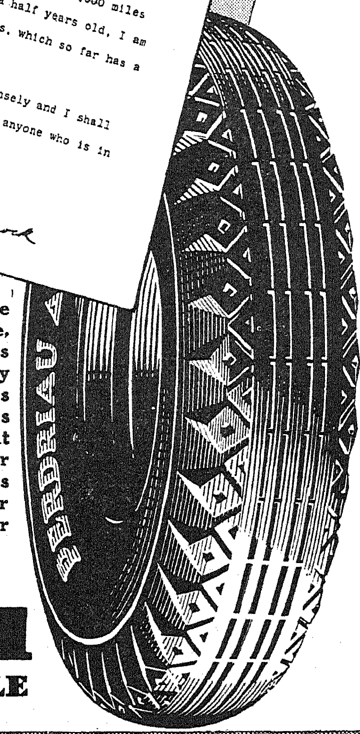
On my first set I claim to have done over 22,000 miles and although my "Flat" car is now five and a half years old, I am still only on my second set of Perdriau tyres, which so far has a mileage to its credit of 16,000 miles.

This performance has pleased me immensely and I shall never be afraid to thoroughly recommend them to anyone who is in doubt as to their reliability and service.

Yours faithfully,

H. R. Hancock

Perdriau toughness prompted users to write thousands of letters like that shown above, And, in the improved Perdriau, this toughness has been doubled. The flexible, chunky rubber in a new Double Triangle Tread has been super-compressed. This process masses into the tread a 100% increase in resilient strength . . . allowing unique capacity for longer mileage. The improved Perdriau is not increased in price, and your local dealer now has full stocks. Ask him to quote for your size.



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DOUBLE TRIANGLE TYRES


MELBA
APRICOTS

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Baringa	H. J. Harley, "Wattle Park," Tullibigeal. A. M. M. Paterson, "Greenhills," Delungra.
Bena	Manager, Experiment Farm, Cowra.
Bobin	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Condobolin. E. S. Hazeldine, "Bunda Farm," Merriwagga. H. J. Harvey, "Kindalin," Dubbo. D. W. Edis, "Prestonville," Ariah Park. A. L. Harnett, Quandialla. W. G. Law, "Thistledown," Gilgandra. H. J. Harley, "Wattle Park," Tullibigeal. E. J. Johnson, "Iona," Gunningbland. C. Condon, Box 9, The Rock. Cullen Bros., "Bunglegumbie," Dubbo.
Canimbla	Manager, Experiment Farm, Cowra.
Cleveland	W. Burns, "Goongirwarrie," Carcoar.
Dundee	W. G. Law, "Thistledown," Gilgandra. A. D. Dunkley, "Bon Lea," Brundah, via Grenfell.
Duri	Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Cowra.
Federation	C. Condon, Box 9, The Rock.
Ford	C. Bennett, "Theole," Forbes-road, Cowra. W. E. Ditchfield, West Wyalong. J. B. White and Sons, Boggabri. A. D. Dunkley, "Bon Lea," Brundah, via Grenfell.
Nabawa	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Condobolin. E. S. Hazeldine, "Bunda Farm," Merriwagga. Mark Sharman, "Mabruk," Erigolia. H. J. Harvey, "Kindalin," Dubbo. David Bolte, "Lincluden," West Wyalong. W. G. Law, "Thistledown," Gilgandra. G. T. S. Troy and Sons, "Fairfield," Quandialla. C. F. T. Anderson, "Swan Vale," *via* Glen Innes.

Wheat—continued.	
Nabawa—*continued.*	H. J. Harley, "Wattle Park," Tullibigeal. E. J. Johnson, "Iona," Gunningbland. Cullen Bros., "Bunglegumbie," Dubbo. J. B. White and Sons, Boggabri.
Pusa No. 111	Mark Sharman, "Mabruk," Erigolia.
Pusa No. 163	Mark Sharman, "Mabruk," Erigolia.
Queen Fan	C. F. T. Anderson, "Swan Vale," *via* Glen Innes.
Riverina	Cullen Bros., "Bunglegumbie," Dubbo.
Wandilla	Manager, Experiment Farm, Cowra. W. G. Law, "Thistledown," Gilgandra.
Waratah	G. T. S. Troy and Sons, "Fairfield," Quandialla. E. J. Johnson, "Iona," Gunningbland. C. Condon, Box 9, The Rock. J. B. White and Sons, Boggabri.
Yandilla King	Manager, Experiment Farm, Cowra. David Bolte, "Lincluden," West Wyalong. A. L. Harnett, Quandialla. A. E. Dixon, "Bramshott," Wallendbeen. A. D. Dunkley, "Bon Lea," Brundah, via Grenfell.
Oats—	
Algerian	W. Burns, "Goongirwarrie," Carcoar. C. Bennett, "Theole," Forbes-road, Cowra. G. S. Moyes, "Fern Hill," Mulgoa.
Belar	Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Cowra. C. Bennett, "Theole," Forbes-road, Cowra.
Buddah	Manager, Experiment Farm, Cowra.
Burke	Manager, Experiment Farm, Cowra.
Gidgee	Manager, Experiment Farm, Cowra.
Guyra	Manager, Experiment Farm, Bathurst.
Kendall	Manager, Experiment Farm, Cowra.
Laggan	Manager, Experiment Farm, Cowra.
Mulga	C. Bennett, "Theole," Forbes-road, Cowra. Manager, Experiment Farm, Cowra.
Cauliflower—	
Mitchell's No. 4	C. J. Rowcliff, Old Dubbo road, Dubbo.
Onion—	
Hunter River Brown Spanish.	P. Morandini, Bunglegumbie-road, Dubbo. S. Redgrove, "Sandhill," Branxton. C. J. Rowcliff, Old Dubbo Road, Dubbo.
Tomato—Strains of tall "Chinese Red," chiefly for glass-houses—	
Australian Large Red ...	Manager, Experiment Farm, Bathurst.
Bendigo Large Red ...	Manager, Experiment Farm, Bathurst.
Boyd's Intermediate ...	Manager, Experiment Farm, Bathurst.
—*Other Varieties*—	
Improved Sunnybrook Earliana	A. Sorby, Macquarie Fields.
Break-o'-Day	A. Sorby, Macquarie Fields.
Pea—	
Greenfeast	P. Morandini, Bunglegumbie-road, Dubbo.

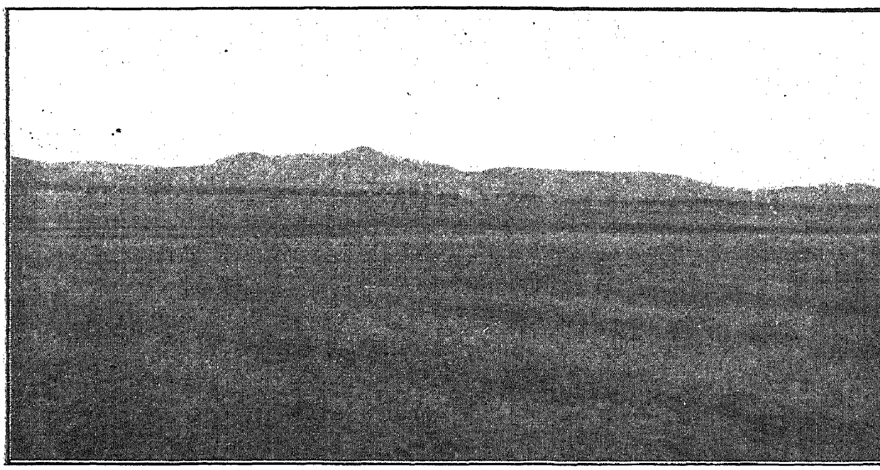
A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

An Unusual Soil Feature.

"LINEAR" GILGAI.

N. H. PARBERY, B.Sc.Agr., Assistant Analyst

MANY thousands of acres of the heavy hill soils around Denman in the Hunter River Valley present an unusual corrugated, or wave-like, appearance. This peculiar surface formation is essentially a feature of sloping or rolling country, and where in a few instances the better known "crab-hole" gilgai occurs in this district, it is located on clay loams or clays of low-lying areas. "Linear," gilgai, as the structure has been termed, is found on the clay loam or clay classes of a number of soil series, the colour of the soils being reddish-brown, yellowish-brown, greyish-black, black or bluish-grey.



Linear Gilgai on Thompson Clay at Denman.

The striations or corrugations of the linear gilgai are parallel and often extend regularly with gentle curves for several hundred yards in the direction of the slope. The waves vary in size from scarcely perceptible mounds several inches high, and about 15 feet from crest to crest, to mounds about 2 feet high, with the arc of the mounds some 20 feet in length, and the crests about 30 feet apart.

A section of the crest of the waves and of the soil between them indicates the origin of this type of gilgai. Apparently the expansion of the heavy soils on wetting leads to an eruption of the subsoil along certain lines of pressure, with the pushing up of parallel mounds. Much of the original subsoil material actually composes the crest of the mound.

The section of the crest of a dark-grey gilgai mound examined consisted of grey to yellowish-grey friable clay passing at 15 inches into

yellowish-grey mottled clay, much fissured to a depth of 36 inches. In the depression between the mounds the profile consisted of dark-grey to bruish-grey clay, passing at 30 to 36 inches into yellowish-grey clay, such as appears on the crest of the adjoining mounds.

The section of a reddish-brown gilgai formation, with an arc of 9 feet, and 27 feet from crest to crest, consisted of light-brown friable clay, puffy or self-mulching, and fissured to a depth of 12 inches, passing into yellowish clay with black mottlings, and fine-grained creamish rock material below 20 inches. In the depression between the crests the profile consisted of reddish-brown plastic tenacious clay, unfissured to a depth of 24 inches, where it passes into yellow-brown clay, with fragments of rotten fine-grained rock.

The crumbly or puffy crest of the corrugations are most frequently devoid of vegetation, which serves to delineate them very clearly, even from a distance, but in places the plains grass, *Stipa aristiglumis*, has adapted itself to the crumbly soil, and, growing to a height of 3 feet, marks the crests by lines of strongly-growing vegetation.

The soils of the linear gilgai formation include alkaline soils, and are generally highly regarded from a grazing point of view.

Barley Varieties under Trial at Cowra and Wagga.

Exceptionally heavy yields were obtained from the barley variety trials conducted at Cowra Experiment Farm last season, writes Mr. A. Pearson, Experimentalist. The trial was sown on a medium granitic loam on 24th May, using 59 lb. seed and 60 lb. superphosphate per acre. The varieties under test, with the exception of Pryor, are of the six-row feed type. Cape topped the yields with 53 bus. 25 lb. per acre, next coming the standard variety Trabut with 51 bus. 48 lb., Commander and Pryor with 42 bus. 30 lb. each, and Deputy 39 bus. 37 lb.

The trial at Wagga Experiment Farm was sown towards the end of May, using 50 lb. seed and 56 lb. superphosphate per acre. The yields, according to Mr. K. G. Carn, the Experimentalist, were:—Trabut 56 bus., Deputy 53 bus., Cape 52 bus 10lb., Commander 52 bus., Pryor 44 bus. 25 lb.

Marketing Horse Hair.

The average farmer who pulls the tails of farm horses yearly can with ease gather enough hair to warrant marketing, particularly at prices around 2s. per pound for first grade hair. Generally this product is discarded and wasted.

When pulling tails, little extra trouble is required to place the hair in a bag; this ensures a clean sample. The hair can be packed and included in a consignment of sheep skins when forwarding to the broker, thereby effecting a saving in freight.

Care in handling and efficient marketing can mean an increase in price of at least 1s. per lb. compared with careless and unbusinesslike methods.—L. Judd, Manager, Temora Experiment Farm.

Artificial Hybridization of Rice.

A Technique Satisfactory for Yanco Conditions.

W. POGGENDORFF, B.Sc. Agr., Assistant Plant Breeder.

During the past four years the writer has attempted to hybridize rice, using the various techniques described by Hector[3], Jones[5], Ramiah[7], Mendiola[6], van der Stok reported by Copeland[2], and Chiapelli[1]. It was found that no technique of hybridization involving any mutilation, or even rough handling, of the glumes gave any noteworthy degree of success; the time spent in the delicate and tedious operation of emasculating unopened florets was out of all proportion to the results obtained.

The Influence of Humidity.

There appears to be general agreement among authorities on the subject that humidity plays a most important part in the success, or otherwise, of artificial crossing. The damage inflicted on the very delicate florets by the usual methods of emasculation entailed by the interlocking glume structure is relatively great. This damage is increased by rapid desiccation at Yanco, where the normal humidity is very low in comparison with rice-growing countries for which data are available. It was found, for instance, that mere clipping of the top of the lemma, without actual emasculation, and even with subsequent protection of the heads with glassine bags, was sufficient to inhibit grain setting altogether; the mutilated florets promptly and invariably withered. Various means of protecting the emasculated florets were tried—bags of various materials, lamp glasses blocked top and bottom mounted on sticks and provided with cotton rope wicks hanging in the water, growing plants in tins which could be moved into shelter—all with comparatively little success, for the damage was apparently initiated before protection could be given. In this connection, it is noteworthy that many workers recommend a glasshouse for artificial hybridization work.

The Method Devised.

During the course of these attempts considerable attention was paid to the conditions governing flowering and pollination, outlined in a previous article (this *Gazette*, December, 1932). Used in conjunction with a method described by Ramiah[7] and Bhide reported by Jones[4], these data provided a way out of the difficulty. Ramiah[7], describing a method in use at Coimbatore (India), states that, particularly where large numbers of crosses have to be made, the florets can be made to open without simultaneous dehiscence of the anthers by covering the chosen panicle with a brown paper envelope about 1 to 1½ hours before normal opening would occur, judged by weather conditions. The anthers are removed and pollination is done as soon as pollen can be obtained.

This method is not always effective at Yanco, while it is also found that on lifting the bag, numerous anthers burst before they can be removed. The following method is now in use.

On bright mornings when the humidity at about 8.30 a.m. is high, promising relatively high humidity when the daily flowering period commences, or on dull, warm "muggy" days, a recently emerged panicle likely to flower that day is chosen. As the florets commence to open the unburst anthers are removed with fine-pointed forceps, and fresh pollen from the chosen male parent is applied to the stigmas immediately. This process is continued until, owing to the decreasing humidity, the anthers tend to burst on emergence, or until the required number of florets has been crossed. All unopened florets are then removed, and the panicle is labelled, covered with a glassine bag, and the stem tied loosely to adjacent stems for support. The bag remains on the head until harvesting time, affording protection against rain, insects, and birds.

To Obtain Suitable Pollen.

One of the universal bugbears of the rice hybridizer appears to be the obtaining of fresh pollen just when required—absolute freshness is essential, and usually entails searching through several panicles for anthers at precisely the right stage of maturity. Best results are obtained with pollen from anthers which emerge whole, but burst on handling. The following method of obtaining suitable pollen has been found very satisfactory. Heads of the required variety which, for preference, have commenced flowering the previous day, are plucked with about one foot of the stem, and the "boot leaf," attached, and floated on two or three straws on the water, within reach, and in the shade of the plant being emasculated. The water temperature, about 77 to 80 deg. Fahr. at this time of the morning, is usually higher than that of the air, and this, together with the high humidity "flushes" out the anthers, which ripen quickly when lifted into dryer air, or sunlight. The use of several heads in rotation in this way provides an abundance of pollen.

A light, three-sided, folding wooden frame covered with cheesecloth is used to isolate the plant being crossed, to minimise risk of wind-blown pollen.

This method of artificial hybridization has several advantages over others:

1. Usually it is 100 per cent. successful, for failures, or suspected failures due to accidental mutilation or self-pollination are removed immediately.

2. Florets are in perfect condition for pollination.

3. The grains set are normal, well-developed, fully protected by the glumes, and not as prone to damage by insects and fungi as are the imperfectly-protected, poorly-developed grains resulting when the glumes are mutilated.

4. The whole operation of hybridization can be performed at the one time and the head bagged and left without further disturbance.

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THE BLOWFLY COSTS AUSTRALIA UPWARDS OF £4,000,000 A YEAR.

THE blowfly is the most serious affliction with which the Australian pastoralist has to contend, and one which in bad years costs upwards of £4,000,000 per annum. It therefore behoves every pastoralist to know all there is to be learned about this problem, and in this connection the bulletin just published by the Department of Agriculture in conjunction with the Council for Scientific and Industrial Research should be in the possession of every sheep-owner in the Commonwealth. Its 136 pages of subject matter are written in a most readable style and discuss all known methods of prevention and treatment of fly strike.

For some years past the two bodies abovementioned have been investigating different phases of the blowfly problem, and some time back a joint committee was formed to co-ordinate the work of the two bodies. One of the first acts of this committee was to prepare the bulletin referred to. The publication is well illustrated and contains a coloured frontispiece of the various species of blowfly associated with strike, from which it is possible to determine the nature and importance of any blowfly captured.

The bulletin ("The Sheep Blowfly Problem in Australia") is obtainable from the Department of Agriculture, Box, 36A, G.P.O., Sydney; Price, 1s. 6d., post free.

Methods Which Assist the Rabbit.

Could Similar Photographs be Taken on your Property ?

Unguarded Post Stays.

One of the stays is inside and the other outside the netting fence, so that rabbits can enter or leave the property as they choose.

Rabbits Are Fond of This Type of Gate.

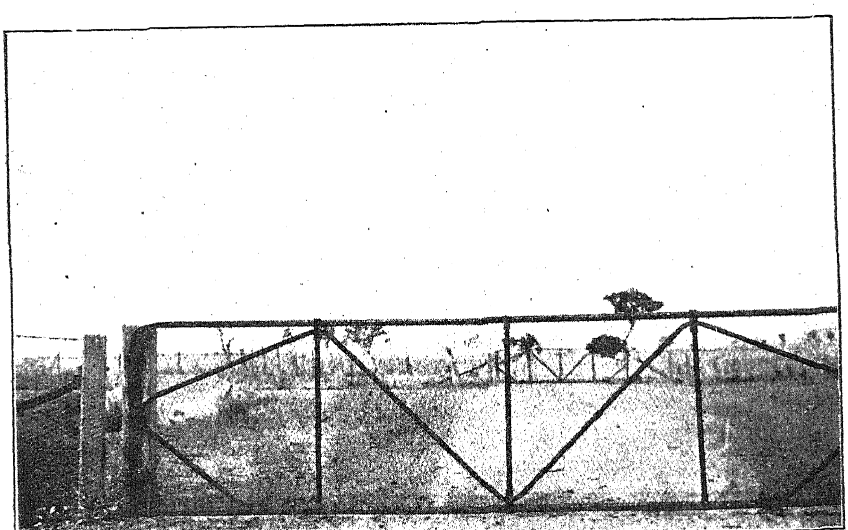
And the owner couldn't understand the recent recrudescence of the pest on his property.

Methods Which Destroy the Rabbit.

Netting Fences which are Rabbit Proof.

An Excellent Method of Guarding Post Stays.

Twin post stays are here guarded by a strip of netting carried from the ground, over the top and down again, being then pinched in and laced on to the fence netting so as to make impassable funnels.



"Money Well Spent."

A gate that is rabbit-proof in every respect. Note how it is hinged on to the post, and not inside the post as is generally the case.

Parasitic Gastro-enteritis in Sheep.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research.

PARASITIC GASTRO-ENTERITIS due to roundworms has hitherto been treated more or less as a single complaint, though it was known that one or more of several parasites might be involved. In general, the symptoms induced by these parasites are much the same, and the fact that frequently the infestation is a mixed one has tended to make any differentiation of the effects of individual parasites rather difficult.

Roundworms Found and their Relative Importance.

The following parasites have been met with and are grouped according to their seriousness:—

A. Parasites causing severe effects and relatively common—
Haemonchus contortus.
Trichostrongylus spp.
Oesophagostomum columbianum.
Oesophagostomum venulosum.

B. Parasites believed to be capable of causing severe effects but not so far found to be the cause, themselves alone, of severe mortalities in this State—
Ostertagia spp. (a harmful parasite in fourth stomach of sheep and calves).
Cooperia curticei (in small bowel).
Nematodirus filicollis and *N. spathiger* (in small bowel).
Monodontus trigonocephalus (in small bowel).
Chabertia ovina (in large bowel).

(The actual pathogenic effects of some of these are somewhat in doubt owing to the fact that pure infestations have not been encountered.)

C. Parasites which probably cause little harm—
Trichuris ovis.
Strongyloides papillosus.

Distribution of these Roundworms.

Though this has not been investigated fully our observations would go to show that all these parasites are liable to be met with in the eastern third of the State, but in the plains country west of that there is little, if any, infestation by *Oesophagostomum* or *Monodontus.*

Of the three most serious parasites, the distribution is apparently as follows:—

Haemonchus.—Coastal belt, tablelands, western slopes, and more closely settled areas of the central plains.

Trichostrongylus.—Whole State, including the far west. Particularly severe on western slopes and parts of the tablelands.

Oesophagostomum.—Coastal belt and tablelands chiefly. Appears to be spreading into north-west plains. Also on some parts of the western slopes.

Susceptibility of Breeds and Seasonal Distribution.

All breeds are susceptible, but *Haemonchus* and *Oesophagostomum* possibly exert more severe effects on the British breeds than on the Merino. *Trichostrongylus* is especially severe on Merino weaners.

From field observation and from certain experimental work carried out at Glenfield it would appear that *Oesophagostomum* requires more favourable conditions for its development, and it is probably due partly to that factor that its present distribution is confined to those areas which do not experience unduly dry conditions. From the relative frequency of *Trichostrongylus* in the drier parts of the State, and the fact that it appears to infest sheep earlier in the spring months than *Haemonchus,* it seems probable that it is better able to withstand the effects of dryness and cold.

Differentiation of Symptoms Caused by these Parasites.

During the past few years considerable experience has been gathered by field and research officers as a result of their investigations, and based on these and personal observations it is believed that when sheep are infested *chiefly* by one or other of these parasites it is possible to differentiate the complaints. It would seem advisable, therefore, to distinguish between them and not to refer to the complaint by the general term "parasitic gastro-enteritis."

The following terms have been given to the parasitisms in question, the name given to each type of complaint including as its root the name of the genus of parasite concerned. The complaints are termed—

(*a*) Haemonchosis.
(*b*) Trichostrongylosis.
(*c*) Oesophagostomiasis.

Haemonchosis.

Due to *Haemonchus contortus,* the "twisted wireworm," a parasite about $\frac{3}{4}$ to $1\frac{1}{4}$ inches long and readily recognised because of its red colour with white spiral ovarian tubes. Present chiefly in the abomasum and sometimes also in the first portion of the small intestine.

It is the largest of the stomach worms, and being readily recognised was formerly thought to be the worm responsible for most damage in this State. Haemonchosis affects both lambs and grown sheep, the latter often severely. Generally speaking it is a complaint of *late* spring, summer, and early autumn. Its most marked symptom is that of anaemia (watery blood, pallor of skin and mucous membranes). Bottle jaw, fluid around the heart, and in the chest and abdomen are commonly seen. Scouring is variable, sometimes absent. Haemonchosis is rapidly fatal.

Trichostrongylosis.

Due to "short hair worms," *Trichostrongylus* spp. (*e.g.*, *Trichostrongylus vitrinus, Trichostrongylus extenuatus, Trichostrongylus circumcincta, Trichostrongylus rugatus,* etc.). These parasites are much smaller than *Haemonchus*. They are met with in large numbers in the small bowel, extending through its length, but usually most numerous in the first 15 feet (except the first 3 feet); they also occur, but in smaller numbers, in the fourth stomach.

Whilst they may be detected on the mucous membrane of the abomasum, they are extremely hard to detect in the small bowel. Few people have sufficiently good sight to detect them with the naked eye, and for most, particularly in a poor light, a hand-lens is necessary. These worms vary from about a quarter of an inch in length and are no thicker than a very fine hair. The fact that they lie coiled in the mucous membrane and are not free in the bowel contents makes their detection difficult.

To diagnose their presence it is necessary to slit up the small bowel and then carefully scrutinise the inner surface throughout its length, particularly the first 15 feet, with a hand-lens. By this means the small reddish worms (some stretched out, others partly coiled) may be seen, looking like small blood vessels.

The symptoms of trichostrongylosis are rather different from those of haemonchosis, and it is notable that this complaint is seen chiefly in weaners and is rarely serious in older sheep. Perhaps the two most marked symptoms induced are stunting of growth and black scours. The complaint tends to appear earlier in the spring than haemonchosis and extends from *early* spring through summer and autumn. (Animals not infrequently in the early spring show trichostrongylosis only, but by summer are affected with both trichostrongylosis and haemonchosis—unless they have received suitable medicinal treatment and proper sheep husbandry.)

It is remarkable that signs of anaemia may be absent until the disease has been in existence for some weeks, and, as skins may appear quite pink, owners often do not feel disposed to believe their sheep are affected by "worms."

Bottle jaw, pot belly and fluid around the heart are rarely seen in this complaint, which tends to be less readily fatal and therefore runs a more protracted course, the most marked symptoms, as mentioned above, being stunting, with more or less black scours.

Oesophagostomiasis.

This is due to *Oesophagostomum columbianum*, the "pimply gut" or "nodular gut" worm, so-called because the larvae burrow in the mucous membrane of the bowel and produce dense shotty nodules in the wall. The adult parasites, which are white in colour and about ¾ to 1 inch in length, lie free in the lumen of the bowel, particularly the large bowl. Larvae are too small to be seen with the naked eye.

This complaint is best diagnosed by the presence of numerous small nodules in the wall of the large bowel, and perhaps the last portion of the small bowel, and of the adult worms in the large bowel.

Oesophagostomiasis is serious in young sheep, particularly weaners and hoggets, though older sheep not infrequently succumb to it.

Affected animals show anaemia and wasting (as shown by paleness of the skin and mucous membranes, loss of condition and harshness of wool). Diarrhoea is marked in the early stages, whilst chronically affected animals may stand with their legs outstretched owing to intussusception of the bowel.

This disease is probably more a summer and autumn disease than the foregoing.

Main Differences Tabulated.

Haemonchosis.	Trichostrongylosis.	Oesophagostomiasis.
Twisted wire worms in abomasum.	Hair worm in bowel (chiefly)	White worm in large bowel—nodules in wall.
Appears later in season (late spring).	Appears earlier (early spring)	Appears later (summer and autumn).
Marked anaemia (early symptom).	Little or no anaemia (late symptom).	Marked anaemia (early symptom).
Stunting not marked ...	Stunting marked (early symptom).	Stunting marked.
Scouring variable	Black scours...	Scouring in early stages.
Rapidly fatal	More protracted	Hoggets rapidly fatal, older sheep more protracted.
Pot belly and bottle jaw common.	Pot belly and bottle jaw absent.	Pot belly and bottle jaw absent.
Lambs, hoggets and grown sheep affected.	Lambs and young hoggets chiefly affected.	Hoggets and grown sheep chiefly affected.

Mixed Infections.

It is well to remember that mixed infections may occur, but from analysis of the symptoms it is possible to form an opinion as to the parasite chiefly responsible and this may be confirmed by post mortem examination.

Practical Importance of Differentiation.

Accuracy of diagnosis is a necessary fundamental for control whether it be prevention or curative treatment.

At the present time one recognises that there is no curative treatment satisfactory for dealing with oesophagostomiasis, and that control depends chiefly upon prevention of infestation of young sheep. Older sheep seem to acquire considerable immunity, but, through carrying the worms, contaminate the ground. Ordinary worm drenches have little, if any, effect on the worms in the large bowel, but by removing other parasites may cause some good effect.

Haemonchosis and trichostrongylosis are at present both treated with the same drugs, but is is quite likely that with further investigation different lines of treatment may be recommended for each complaint. In general, it may be said that haemonchosis is more easily dealt with. Trichostrongylosis requires more frequent drenching, especially if, as is usually the case, the complaint has not been recognised early.

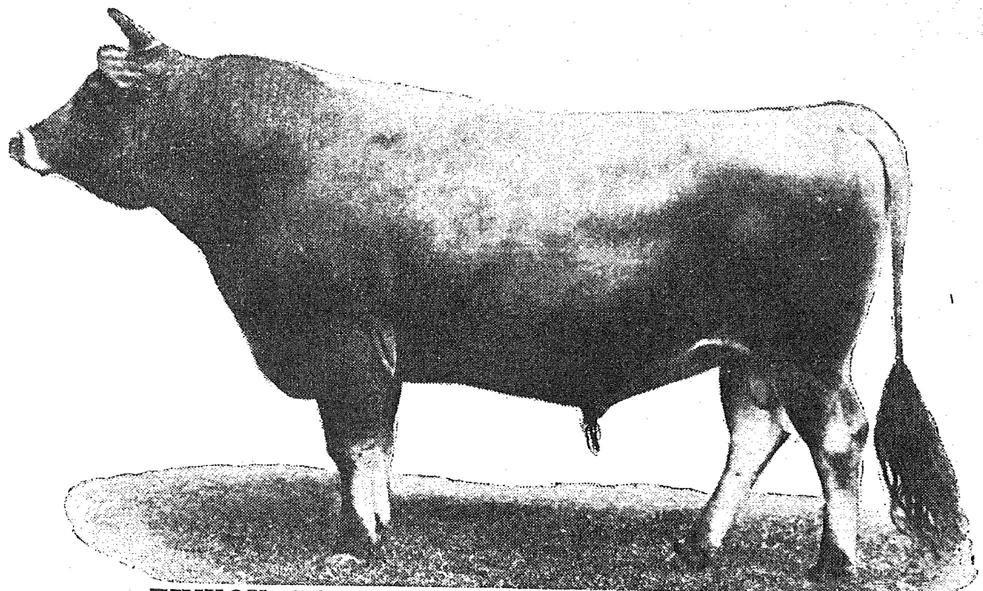
Improvement in accuracy of diagnosis in the future will therefore give a better understanding of the effects of each kind of parasite and assist in obtaining more exact information regarding the value of methods adopted for prevention and treatment.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st December, 1932:—

Description.	Imports.	Exports.
Interstate.	Cases.	Cases.
Fresh Fruit ...	295,524	183,157
Tomatoes ...	141,985	4,803
Bananas	16,945	44,927
Pines	42,669	1,496
	trays.	
Strawberries ...	543	...
	cases.	
Melons	882	...
	tons.	
,, ...	28	...
	lb.	
Canned Fruit ..	32,032	...
Dried Fruits—		
Unspecified ...	282,744	...
Currants ..	20,216	...
Raisins ..	27,496	...
Apples ...	1,708	...
Apricots ...	1,148	...
Prunes ...	1,288	...
Pears	672	...
Peaches ...	868	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	392
Bananas ...	....	2,315	..
Lemons ...	....	224	424
Oranges ..	....	55	38,857
Grape Fruit ...	....	69	26
Pears	....	...	29
Pineapples ...	....	...	1,917
Other	....	7	6,932
Dried Fruits—		lb.	lb.
Apples ...	....	...	2,906
Apricots ...	....	...	978
Currants ..	....	..	7,336
Figs	Iraq	18,680	...
	United Kingdom ...	260	...
	Asia Minor ...	1,263	...
	Turkey ...	117,207	...
	United States	10,879	...
	Italy	21	...
Prunes ...	United States .	1,050	4,868
Raisins—			
Sultanas .	....	...	7,988
Lexias ...	....	...	336
Other ..	Spain	2,476	2,196
Dates	Iraq	3,027,694	19,792
Other	China	3,851	...
	Spain	162	1,709
	Turkey ...	2,404	...
Preserved in liquid—			
Apricots ...	....	...	520,551
Peaches ...	....	...	796,423
Pears ..	....	...	14,282
Pineapples ...	....	...	2,072
Raspberries	....	...	1,160
Other ...	....	...	46,730
		Gallons.	
.. ..	....	3,218	...



FINVOY GOLDEN NOBLE (Imp. N.Z., Vol. 15).

Departmental herds include the following Stud Bulls :—

Guernsey : HOPEFUL OF WOLLONGBAR (499), Champion, R. A. Show, Sydney, 1928. ***Ayrshire :*** SCOTTISH PRIDE OF GOWRIE PARK (3797), First and Champion, R. A. Show, Sydney, 1927; First and Reserve Champion, R. A. Show, Sydney, 1928. ***Milking Shorthorn :*** MORNING STAR OF DARBALARA (Vol 8), Second, R. A. Show, Sydney, 1928. Morning Star is ex Melba 15th of Darbalara, World's champion cow of all breeds—32,522.5 lb. milk, 1,614.1 lb. butter fat in 365 days. ***Jersey :*** FINVOY GOLDEN NOBLE (imp. N.Z., Vol. 15).

The Department has for sale young bulls from tested dams of the following breeds :—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

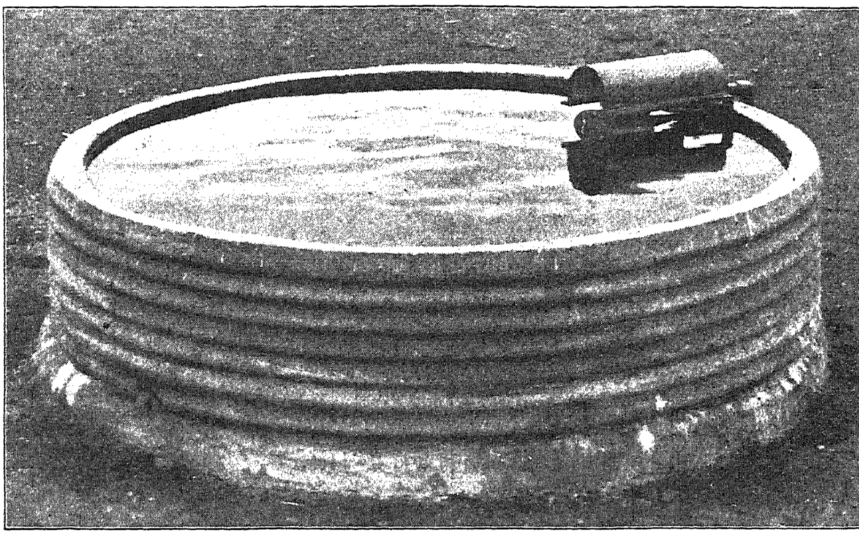
Application should be made to—THE UNDER SECRETARY, Department of Agriculture, SYDNEY

Dairying Notes.

Poor Water—Small Cheques.

THERE is nothing to pull down the dairy farmer's cheque quicker than poor drinking water for the herd. The effects are immediately reflected in both the quantity and quality of the milk produced. This is not hard to appreciate when it is known that milk contains 87 per cent. of water. An ample supply of pure water is therefore essential for dairy cows, not only in the interests of production, but also to maintain the herd in good health and condition.

On many of our coastal dairy farms running streams keep up a constant supply of the purest water, but in other instances, and particularly on some of the inland properties which have recently been given over, either wholly or partly, to dairying, some provision has to be made to keep up a



Concrete Drinking Trough.
Can be constructed to suit any class of stock.

plentiful supply of good drinking water. In such cases concrete troughs answer the purpose admirably. It may even be worth while constructing a large concrete storage reservoir on the same lines, the water from which could be reticulated to smaller concrete troughs conveniently located about the farm.

Even on farms that have permanent streams and springs it may be that these are not conveniently situated, with the result that the milking cows are forced to walk long distances two or three times each day for a drink. This is to be guarded against, otherwise much of the food consumed will be used to supply energy instead of milk. Here again the concrete drinking trough will soon pay for the cost of construction.

Sterilised Bone Meal for Dairy Cows.

The great bulk of soils throughout the State are deficient in phosphorus and calcium, particularly after they have been used for grazing for long periods. If the soil is deficient in these minerals, the plants growing upon it are likewise deficient.

These two minerals enter very largely into the composition of bones, hence young animals developing their skeletons require greater amounts of these minerals than grown animals. Similarly the pregnant female requires large amounts of these minerals in order to supply the needs of her own body, and also to build the skeleton of the growing foetus. Milk contains .75 per cent. ash, and of this 70.5 per cent. consists of calcium and phosphorus compounds, totalling approximately .53 per cent. of the milk. As the dairy cow is in the majority of cases both pregnant and milking at the same time, the amount of minerals required by her is greatly in excess of that sufficient for a steer or other adult which requires only sufficient to replace body waste.

It is evident, therefore, that in order to obtain the maximum results phosphorus and calcium deficiency must be rectified. Probably the best method of accomplishing this is by top-dressing the pastures with fertiliser. Next in importance to top-dressing is the supply of an adequate mineral lick, that is to say, a lick containing large amounts of these two minerals—phosphorus and calcium. Some owners have adopted the practice of supplying a lick containing superphosphate, which certainly supplies these two essentials, but superphosphate is a crude product containing many impurities which are liable to cause disorders of the stomach and intestines if partaken of in large amounts or over long periods. The best method of supplying phosphorus and calcium is in the form of sterilised bone meal, which is a form of calcium phosphate. This is the product of ground-up sterilised bones obtained from animals slaughtered for human consumption, and it naturally contains all the minerals present in the animal's skeleton.

Advice to Inland Dairy Farmers.

In drawing the attention of inland dairy farmers to some of their shortcomings in regard to the handling of cream, Mr. A. T. R. Brown, Senior Dairy Instructor, pointedly referred to the fact that since dairy farming had been embraced by inland farmers the percentage of choicest grade butter manufactured in New South Wales had decreased considerably. Mr. Brown was addressing the annual conference of the south-western branches of the Agricultural Bureau, which was held at Young last month, and at which there was a fair sprinkling of "inland" dairy farmers.

The amount of low-grade butter being produced in the south-western district, said Mr. Brown, was causing him some concern. The condition in which cream reached the factory largely determined the grade of butter manufactured therefrom. To produce choicest cream it was necessary,

Good Cows and Good Pastures—A combination that Pays.

among other things, to pay particular attention to separating and the after-treatment of the cream. Separating should be done with the milk at blood heat, and with the cream screw regulated to deliver cream of proper consistency. It was in regard to this latter point that much cream was spoiled. In very many instances the cream delivered to local factories was far too thick. If cream was so thick that it would not pour out of the cans trouble was almost sure to follow. Thickness, moreover, was often associated with staleness, due to farmers holding their cream too long before delivery. Cream, particularly in the hot districts and during the summer months, should be delivered as often as possible, and in no instance should delivery to the factory be less frequent than twice a week.

Immediately after separating, the cream should be cooled as rapidly as possible. This procedure would stay the growth of harmful bacteria which required warmth for their growth and multiplication.

New Butter and Margarine Standards.

New regulations under the Amending Dairy Industry Act, prescribing revised standards for butter and margarine, were gazetted on the 14th of last month.

These new regulations set out that butter is the clean, non-rancid, fatty substance obtained by churning milk or cream, that it shall contain not less than eighty parts per centum of milk fat, and shall not contain more than sixteen parts per centum of water and/or three parts per centum of salt (sodium chloride). It is also laid down that butter shall not be mixed with any foreign fat or oil, and shall not contain any foreign substance except salt (sodium chloride).

With regard to margarine, it is prescribed that this shall not contain any vegetable or animal oils or fats containing colouring matter which alone or in combination will produce a colour resembling that of butter, and further that it shall not contain more than sixteen parts per centum of water and/or any preservative other than salt (sodium chloride). In addition, its fat content shall have a maximum Kirschner value of 4.5.

It is provided that margarine shall not contain or have added to it before or during or subsequent to being processed, treated, manufactured, or otherwise dealt with, any chemical fluid or substance which may give it an appearance, colour, aroma, or taste resembling that of Australian, Danish, or any other butter. The use of pure biological cultures, lactic acid starters or lactic acid in any form in the manufacture of margarine is prohibited, and the regulations prescribe also that margarine shall not contain palm oil, and that where made from cocoanut oil, either alone or in combination with other vegetable or animal fats, shall retain a readily appreciable flavour of cocoanut oil.

Non-compliance with the foregoing regulations renders offenders liable to a heavy penalty.

Two Recipes for Whitewash.

Whitewash is generally considered indispensable on the dairy farm. Poorly made and improperly applied, however, it can become a source of trouble when it flakes off or cracks in such a way as to provide harbour for dust and filth.

In the first of the recipes given hereunder tallow or fat is included. Some dairymen object to the use of such substances in whitewash, but if mixed thoroughly with the lime during the process of slaking they lose much of their fatty properties. However, for the peace of mind of those who prefer whitewash without fats or oils as binders a second recipe is given.

Recipe No. 1.

Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will "curdle." Before the lime commences to boil fiercely, add tallow or common fat in the proportion of about 1 lb. to 14 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained and, if desired, may be applied whilst hot.

Recipe No. 2.

In a manner similar to that described above slake half a bushel of lime. Then strain the liquid through a fine sieve or strainer and add to it a quarter of a bushel of salt previously dissolved in warm water. Next take 3 lb. ground rice boiled to a thin paste, and stir in while hot ½ lb. Spanish whiting and 1 lb. of clear glue previously dissolved by soaking in cold water and then hanging over a slow fire in a small pot hung in a larger one filled with water. Add 5 gallons of hot water to the mixture, stir well, cover it from dirt, and let it stand a few days. For best results this whitewash should be applied whilst hot.

South Coast and Monaro Bureau Conference on 4th and 5th May.

It has now been decided definitely that the dates for the abovementioned conference to be held at Merimbula are 4th and 5th May next. Already arrangements are well in hand and the organisers are looking forward to a successful gathering.

It is not generally known, perhaps, that it is not necessary to be a member of the Agricultural Bureau to attend and take part in the discussions at these district conferences. As many problems concerning South Coast and Monaro farmers will come up for discussion, and as a series of interesting and informative addresses will be delivered, farmers, in particular, should make an effort to be present.

An Opportunity to Advertise our Goods in the East.

PARTICULARS are to hand with regard to the Empire Fair, which is to be held in Hong Kong from 24th to 27th May next.

It is stated in the correspondence dealing with the matter that a representative exhibit of Australian products would be welcomed—principally food products—and the suggestion is made that pictorial displays and cinematograph films would be of considerable value. It appears that at the first Fair of this kind, which was held in May last year, the exhibits staged were principally such as would appeal to the retail consumer, *e.g.*, tinned fruits from Australia, Canada, and the United Kingdom, wines from Australia, liquors from other parts of the British Empire, etc. As the Fair is only for such a short period it is not considered that the expense of exhibiting the products of heavy industries would be warranted.

The necessary accommodation for the Fair is being made available free of charge in the largest hotel in Hong Kong. The committee, therefore, do not intend to make any charge for space or for stands unless the demands are so great that it is found essential to erect a temporary structure on adjacent vacant land. In the somewhat unlikely event of that having to be done, the committee might find it necessary to levy a charge on all exhibitors; but it is expected that the amount per head would only be small. It is hoped to secure the use of a picture theatre near the hotel for the screening of any cinematograph films.

Where a Dominion is unrepresented at Hong Kong, it is understood that a sub-committee will take charge of that Dominion's stand and see that the exhibits are properly displayed.

The committee are anxious to receive as soon as possible applications for space and an indication of the area required. Last year it appears that several intending exhibitors were excluded on account of the lateness of their applications.

The Australian-Oriental Line Limited advises that it will be pleased to carry Australian exhibits to the Fair at half rates.

Prospective exhibitors can obtain additional information on application to the Department of Agriculture, Box 36A, G.P.O., Sydney.

Onions a Good Sideline on the Far North Coast.

ONION trials at Wollongbar Experiment Farm, near Lismore, over the past five years have demonstrated that onion production for local consumption is a suitable sideline to dairying in that district. According to Mr. G. Giles, the experimentalist who conducted the trials, the limiting factor is availability of hand labour.

Last season's trial was sown on 9th April in typical deep red basaltic soil. Harvesting took place on 5th December, the variety Lord Howe Island yielding best with over 16 tons 2 cwt. per acre. Next came the standard variety Hunter River Brown Spanish with 15 tons 14 cwt., S. Redgrove's strain of the same variety 15 tons 4 cwt., Early Improved Hunter River Brown Spanish 15 tons, the only other variety to yield over 14 tons being Hunter River White with 14 tons 14 cwt.

The Value of Breeding and Production Records to the Dairy Farmer.

I. W. SCOTT, Senior Dairy Instructor.

In an article by a veterinary officer, published in this *Gazette* recently, the keeping of breeding records of his cattle by the dairy-farmer was discussed, particularly from the disease control aspect. The object of the present article is to point out the value of such records in assessing the effect of the breeding policy followed on the production of the herd, and to suggest the form the records should take for such a purpose. This information should be of particular value to those dairy-farmers who are recording the production of their stock under the scheme conducted by the Department.

It is astonishing how few dairy-farmers keep any permanent and reliable record of the breeding and production of their stock. The majority are aware of the necessity for using a bull of known production strain and of keeping the heifers from the best cows, but they fail to keep records of such a nature and in such a manner that they are able to see readily the results of any particular breeding policy followed, with the result that a vast number of the men recording their stock under the scheme conducted by the Department of Agriculture are not obtaining the benefits from the scheme that they should. It is with the idea of creating greater interest in the breeding and production records that the following suggestions are made.

In many instances but scanty information is kept of the breeding operations of the herd; often no reliable information is available as to when certain cows are due to calve, with the result that the animals are milked too long and do not get sufficient spell between lactations, or are dried off too soon, with resultant loss. With laxity of keeping records also goes in most cases, laxity of control of the herd sire and here let a plea be put forward for better care and control of the sire, particularly when he is pure-bred with good production backing. A special bull paddock, varying in size in accordance with the carrying capacity of the land (about 3 acres being desirable in inland districts) should be provided, handy to, and in sight of the cow paddocks. In one corner a small service yard with a crush should be built.

The progeny and lactation records to be explained and illustrated will be useful to any farmer, but doubly so to the man who is recording the production of his stock and who is genuinely interested in putting his dairy on a business footing. Indexing each cow's history is building up a record that increases in value each year. These record sheets are not put forward as a tentative suggestion, but are the result of the study of different systems of indexing already in use among grade herds in my district.

Marking the Calves.

Before going any further it would be well to discuss first the marking of the progeny in such a manner that their identity is later indisputable. The habit of relying on memory to positively identify "Mary's heifer's heifer" from a bunch of perhaps thirty animals that the owner may not have seen for some time, belongs to the "dark ages" and some positive method should be adopted. The most reliable is probably that of tattooing each calf soon after birth with an identification number in the ear.

Two systems already successfully being employed are put forward as suitable for grade herds. The first is the Dewey decimal system; in it three numbers are always used, and it allows for ninety-nine female calves a year; the first figure to the left signifies the year, the second and third figures the number of the calf, *e.g.*, the first calf born in 1931 would be tattooed 101, the tenth would be 110, and the fiftieth 150; similarly the first, tenth, and fiftieth heifer calves born in 1932 would be 201, 210, and 250.

The second system is to allot each calf a serial number to be placed over that of the dam in the ear. For example, if cow number 53 has a calf that is the tenth calf born on the farm or from the date of commencement to tattoo, this calf would be tattooed $\frac{10}{53}$ and the 105th calf born would be 105 over the number of the dam. Both these methods are being used quite satisfactorily.

When the tattooed heifer calves, she is given and branded with a herd number by which she is known in future. When tattooing, the ear of the calf should first be thoroughly cleaned with the aid of methylated spirits. Tattoo ink has been found more satisfactory in this district than the solid stick.

As a tattoo outfit costs £3 to £4, it may be possible for the members of a recording unit to "club in" and purchase an outfit that could be circulated by the herd recorder each month.

For those who prefer a system of fire branding, small cheek brands are suggested, the calf being branded on the cheek with a system of numbering similar to that described for tattooing. Alternatively, after each cow has been branded to say 100, the calves could be numbered from 101, that number being retained throughout life.

Service and Calving Records.

The first permanent record that should be kept is a service and calving record, and the following rulings are suggested, having been found suitable in practice.

SERVICE Record.

Date.	Cow's Name or Number.	Sire.	Date Due.	Remarks.
29 June, 1931 ...	62	Sparkler ...	7 April, 1932	....
29 June, 1931 ...	23	No service	....	....
....	....	....	....	....
....	....	....	....	....

CALVING Record.

Date.	Cow's Name or Number.	Sire.	Sex of Calf.	Tattoo of Calf.	Remarks.
21 Sept., 1931	53	Sparkler ...	F.	26/53	....
22 Sept., 1931	14	Sparkler ...	M.	....	Dead.
....	....	....	....	....	....
....	....	....	....	....	....

These rulings are self explanatory, and the purchase of a shilling exercise book is all the expense that is necessary. A book with a strong cover is preferable. The left-hand side is used for the calving record and the right-hand side for the service records, a page at least being allotted to each month. If a strip $\frac{3}{4}$ inch wide is cut off the top of each of, say, twelve sheets, the particulars or headings, date, cow, sire, etc., can be written on the thirteenth sheet, the ruling of straight lines then being all that is necessary on each page.

The particulars of calving records are transferred at regular intervals to the progeny records on the lactation and progeny sheets or cards, forming in time a complete breeding record of each cow.

Progeny and Production Records.

On the front of the progeny and lactation sheets or cards illustrated on page 302, a convenient size for which is 8 inches x 5 inches with perforations to fit in a loose leaf binder, particulars of each cow's known history are recorded, as well as her own breeding and progeny record, while on the back of the card the monthly milk, test percentage, fat and progressive fat totals are recorded, and space is provided for noting any factor that may affect her production as well as her lactation yield for 270 days. Thus in time each cow and her progeny can be rapidly assessed as regards persistency of breeding and production, two factors to which little attention is paid at present, but which are vital to the building up of a herd free of disease and capable of transmitting the desirable qualities of high and persistent production coupled with regular breeding.

The lactation and progeny records can be printed at very small cost either on cards or on stout paper, which has been found quite satisfactory. Loose leaf binders to hold the sheets or cards can be purchased for about 12s. 6d., or the farmer can, with little trouble and expense, make a binder himself.

Examples of these records are given below.

PROGENY RECORD.

Cow's Name: Mary.	Number 53. Sire and Dam.	G'ss and G'ds.
Markings, History, etc. ... Dark fawn—Appears like J x Shorthorn — Good Dairy type—Branded L, rump XY.	Sparkler of	Jewel's Pride.
		Cissie of......... 10,000 lb. milk, 5% = 500 lb. fat, 273 days.
	Unknown.	

Year.	Date of Birth.	Sex.	Sire.	Tattoo of Calf.	Name.	Remarks.
1931	21–9–31	F.	Sparkler ...	$\frac{26}{53}$	Mary 2nd ...	....
1932	21–11–32	M.	Sparkler ...	....	....	Killed.
19						
19						
19						
19						

[Reverse side]

PRODUCTION RECORD FOR THE YEAR ENDING 30TH SEPTEMBER.

COW NO. 53——

Monthly Production for 30 Days.

1932.				1933.				1934.				1935.				
Milk.	Test	Fat.	† Fat.	Milk.	Test	Fat.	† Fat.	Milk.	Test	Fat.	† Fat.	Milk.	Test	Fat.	† Fat.	
lb.	%	lb.	lb.	lb.	%	lb.	lb.	lb.	%	lb.	lb.	lb.	%	lb.	lb.	
600	5	30	...													October.
300	5	15	45													November.
	Dry.															December.
930	4·6	42·8	87·8													January.
300*	5	15*	102·8													February.
400	4·8	21·6	124·4													March.
405	5	19·9	144·3													April.
540	5·2	28·1	172·4													May.
600	5	30	202·4													June.
600	5	30	232·4													July.
540	4·8	25·9	258·3													August.
450	5	22·5	280·8													September.
5,665	5	280·8	11 mths.													

Lactation Records and Factors Affecting Yield.

Milk—4,765 lb.			
Fat—235 lb. ...			
Days—273 ...			
* Mammitis.			

† Progressive Total of Fat..............................

Blend Your Cream on the Farm.

WHY AND HOW IT IS DONE.

E. O. DALGLEISH, H. D. D., Senior Dairy Instructor.

It has been the practice with very many farmers to keep the cream obtained from each separation in different utensils and only mix these together just prior to sending to the factory. In this way the first separation, which has been kept by itself, often becomes stale and overripe, and each of the subsequent lots is similarly affected, though to different degrees, according to the length of time they are held after separating. When these lots, consisting sometimes of from four to six separations, as the case may be, are bulked together, some of the blend is almost sure to be of at least doubtful quality.

The way to overcome this trouble is by blending the various separations immediately they have been cooled down sufficiently. How this can best be done is described in the following article.

How to Blend Cream.

AN examination of cream on the grading floor of almost any factory will indicate that there is great need among farmers for the use of more modern methods in the keeping of their cream, and the question of how this is done on the farm is one which vitally affects every diary-farmer. One of the most important operations in this regard is the proper blending of the cream after separation.

The process of cream souring, or in other words ripening, is vitally necessary in butter-making for the development of the delicate butter flavours. The farmer's job is to do all in his power to see that this ripening takes place in a normal manner. He cannot prevent the entry of the milk-souring bacteria responsible for the souring of the cream, but he can control their abnormal multiplication and thereby prevent faults known as staleness and overripeness, which in their turn lead to the development of other off-flavours, possibly terminating in rancidity. There are a number of ways by which the farmer may protect his cream from becoming overripe, or, as is technically described, from having high acidity;—

1. Keep the cream as cool as possible.
2. Thorough cleansing and final scalding of utensils with boiling water.
3. Separate at the correct fat percentage.
4. Last, but by no means least, is the important item of correctly blending the various separations with each other while holding them at the farm and before despatch to the factory.

The first three factors will help to control within satisfactory limits the germ content of the cream.

Why Blending is Necessary.

The correct method of blending cream on the farm in order to preserve its quality is to mix each separation with the bulk as soon as the animal heat from the cow's body has left the cream; usually this will be about an hour or so after separation, although if a cooler is used the cream is ready for blending immediately on being cooled and aerated.

It is a recognised fact that separate small quantities of cream are more difficult to hold in a satisfactory condition than larger amounts, consequently the farmer should keep his supply in as large a bulk as possible.

Don't Use Benzine or Kerosene Tins.

Benzine or kerosene tins should not be used as containers in which to store cream. They are too small for the purpose and in other respects have been found unsatisfactory. They rapidly lose their thin coating of tin, and in this condition may cause the contents to take on a metallic flavour. With the seams flush soldered they may be used, however, to separate into, if the tin coating is intact. Cream should be stored in the cream room in a clean can of the size which will be sent to the factory on delivery day. If two or more cans are to be sent, use that number to start with, and when the cream is cool place as near as possible equal parts of each separation into each can. Thorough stirring with a metal stirrer is a very necessary adjunct to correct blending.

The mixing of the fresh cream with the later separations encourages an even souring or ripening and ensures regular and satisfactory quality on arrival at the factory.

Some objection to blending has been raised by the older generation of dairy-farmers, many of whom hold that if each separation is kept apart, when sent to the factory only part of the supply will be graded "second grade." To these objectors, however, it might be stated that the aim of all dairy-farmers to-day is, or should be, to have all their produce, and not merely a portion of it, of the highest quality, viz., "choicest." The present economic position has made this imperative, and those producers who have not already done so would be well advised to follow modern methods, which have proved so successful, and some of which are herein outlined.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Gunnedah (R. A. Brown) ...	... April 4, 5, 6	Casino (E. J. Pollack) ...	... May 17, 18
Muswellbrook (R. C. Sawkins) ...	„ 5, 6, 7	Trangie (F. H. Hayles) ...	... „ 30, 31
Sydney Royal (G. C. Somerville)	„ 10 to 19	Tullamore (W. J. Colville)	... July 26
Kempsey (E. E. Mitchell)	... „ 26, 27, 28	Peak Hill (W. R. L. Crush)	... Aug. 1, 2
Gresford (A. E. Brown) ...	... „ 28, 29	Trundle (D. Leighton) ...	... „ 8, 9
Orange (G. R. Williams) ...	... May 2, 3, 4	Condobolin (J. M. Cooney)	... „ 15, 16
Narrabri (D. McR. Fraser)	... „ 3, 4	Bogan Gate (J. T. a'Beckett)	... „ 23
Grafton (L. C. Lawson) ...	... „ 3 to 6	Parkes (L. S. Seaborn) ...	... „ 29, 30
Wellington (A. T. Smith) ...	... „ 9, 10	Forbes (E. A. Austin) ...	... Sept. 5, 6
Maclean (T. B. Notley) ...	... „ 11, 12	Narrandera (J. D. Newth)	... Oct. 3, 4
Dubbo Diamond Jubilee (F. W. K. Wise.)	„ 16, 17	Deniliquin (P. Fagan) ...	... „ 4
		Leeton (E. C. Tweedie) ...	... „ 10, 11

Infectious Diseases of Dairy Cattle.

An Outline of a Simple Scheme of Prevention.

W. L. HINDMARSH, B.V.Sc., M.R.C.V.S.

We have been told, and rightly so, that for success in any branch of animal industry it is essential that we should have good stock, and that such stock should be fed well, said Mr. Hindmarsh by way of introducing a broadcast address on the above subject. No one will deny, he continued, that cattle of good milking strain must be obtained, and the importance of a correct diet cannot be overemphasised. But it is equally important that the cattle should be protected from infection with the various diseases that may attack them.

Of what use are good cattle, well fed and housed, if the milk is to be lost from attacks of mammitis, if the breeding cycle is to be interrupted by contagious abortion and sterility, if the cattle die of pleuro-pneumonia, if the calves are lost from the various infections of young cattle, or the adult animals be destroyed on account of tuberculosis ?

Important as the question of disease control is recognised to be, and serious as are the ravages of disease, it is rare to come in contact with a farmer who has laid down as part of his scheme of management a series of measures especially directed toward disease prevention. Probably many farmers would regard such a scheme as too ambitious and beyond their powers, when as a matter of fact most of the principles involved are simple, and it is not necessary to be a veterinarian to understand them.

As soon as we have grasped the fact that most of the diseases which cause extensive losses are infectious, the problem resolves itself into the question: How can we prevent the infection from gaining entry to the farm?

How Cattle become Infected.

Now, infection may gain entry by direct or indirect contact with diseased cattle. By preventing that contact your cattle are protected from many diseases. By direct contact we mean that the cattle are actually with the diseased animal, in the paddock, yard, or bails. By indirect contact we imply that the cattle did not actually meet, but that some person, animal, object, or building was first in contact with the diseased animal, and then later with a healthy beast. Some person, animal, or object acted as a go-between and carried the infection.

Briefly, some of the methods by which your cattle may mix with infected animals are:—

1. You may attend a sale and purchase stock and place the new purchases with your herd.
2. A diseased animal straying on the road may find the weak spot in your fence and mix with your cattle.
3. A diseased animal may be borrowed for breeding purposes.
4. You may loan an animal to a neighbour.
5. Your cattle may stray and mix with infected cattle.

Many other means by which your cattle may mix with those of other owners will occur to you. The point which must be grasped is that there are many avenues for contact between healthy cattle and those of doubtful health, and this contact must be guarded against.

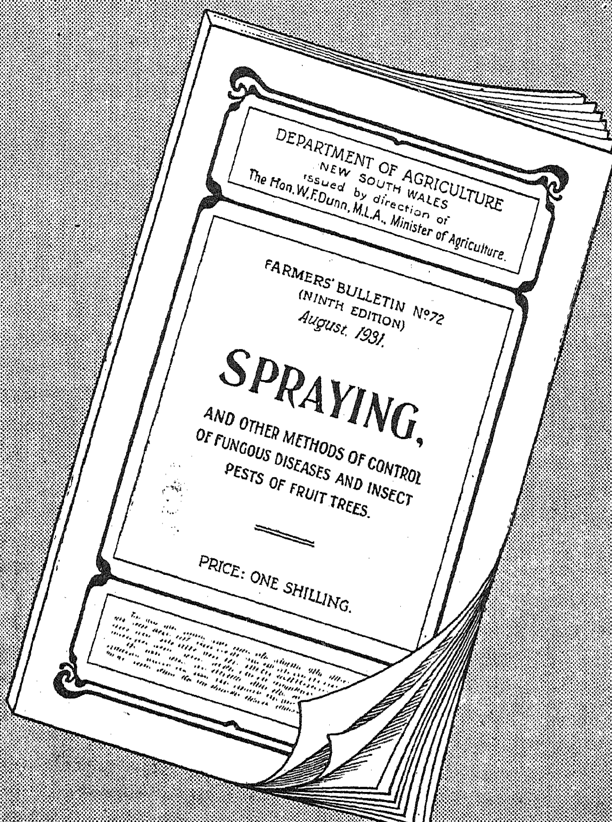
Regarding indirect contact, with cattle this method of transfer of infection from farm to farm is not as important as that of direct contact. It is quite possible, however, for a neighbour to have attended a sick animal on his own farm and to handle your cattle shortly after. His attention to your cattle could be followed with a transfer of infection to your herd. Or again you may have borrowed an instrument, syringe, pump, etc., which had been used in the treatment of an infected animal. Such instruments used for healthy cattle may spread infection. Thus a dirty teat syphon may spread mammitis, a dirty pump or douche transmit genital infections, and so on. More rarely, infected material may be carried by other animals or birds or may be water-borne.

Learn to Detect Affected Animals.

Let us consider now the means that may be adopted by the farmer to protect his stock from infection. As we have shown, the most important step is to prevent contact with infected cattle.

It is fairly obvious that no animal, unless it is known to be healthy, should be placed with the herd. Usually the attitude of the dairy farmer is an indifferent one rather than a definite one. Instead of making every effort to ascertain that a cow is not only free from disease, but also that it has not been in contact with any infected cattle, farmers, when making purchases, are inclined to say: "The cow looks all right, I'll take her." The animal may have had mammitis, may have aborted, may have suffered from pleuro-pneumonia, and so on, but she looks all right, and so goes into the herd. You may well ask: "How is the farmer to know that a cow has not suffered from infectious disease?" In reply I would advise him not to buy a cow unless he can satisfy himself that it is from a herd with a clean record. The farmer who attends a sale and buys cattle without knowing their origin and history is weighting the scales against himself as far as disease is concerned. Many farmers taking up dairy-farming for the first time have found to their cost quite recently how easy it is to acquire unsound cattle. Further, I would advise the farmer to learn to recognise the effects of disease on stock and not to purchase any animals which show such effects. Take mammitis, for example; it almost always leaves evidence in the udder of its occurrence. The farmer who knowingly buys a cow that is a "three teater" or has a "weak quarter" is buying a lot of trouble for himself.

From the fact that he is constantly handling the udders of cows during milking operations, a dairy farmer should be accustomed to the "feel" of a healthy udder, and therefore should readily detect any change. Yet few farmers make a point of familiarising themselves with the changes that occur when mammitis attacks the cow, and they do not hesitate to buy a



DEPARTMENT OF AGRICULTURE
NEW SOUTH WALES
Issued by direction of
The Hon. W. F. Dunn, M.L.A., Minister of Agriculture.
FARMERS' BULLETIN No. 72
(NINTH EDITION)
August, 1931.
SPRAYING,
AND OTHER METHODS OF CONTROL OF FUNGOUS DISEASES AND INSECT PESTS OF FRUIT TREES.
PRICE: ONE SHILLING.

good looking animal without handling the udder first. Similarly, loss of part of the tail suggests inoculation for pleuro-pneumonia, matting of tufts of hair below the vulva suggests genital infections and so on.

Services that are Available to Farmers.

Full use should be made of the facilities offered by the Stock Branch of the Department of Agriculture and the Veterinary Research Station at Glenfield for laboratory diagnosis. An examination of the blood of a cow will indicate whether the animal has been infected with contagious abortion. Milk examination reveals the presence and cause of mammitis and so on. When dealing with infectious disease scheduled under the Stock Diseases Act, the local Inspector of Stock must be informed and he can give much good advice as to the methods of control and the specimens needed for laboratory examination.

Dairy farmers should also avail themselves of the services of practising veterinary surgeons. Remember that the veterinary surgeon is just as essential to the health of your stock as is the doctor to the health of your family. A veterinary surgeon charged with the maintenance of the health of your herd could not only assist you to avoid loss, but would relieve you of much anxiety when contagious disease is prevalent in the district.

No farm should be without an isolation paddock. Whenever cattle are newly introduced to the farm they should be placed in the isolation paddock until you are satisfied that they are healthy. Similarly, if any doubt is held concerning the health of any animal on the farm it should be isolated until a definite opinion as to its condition is formed.

Closely related to the subject of isolation paddocks is the question of keeping your fences in order. A fence in bad condition is an invitation to straying cattle to feed on your land, and an invitation to any wanderers in your herd to escape. Similarly, take care that your gates close and are capable of being fastened securely. On many dairy farms the gates are in a very unsatisfactory condition.

You will note that these measures are all directed toward the prevention of contact of your animals with infected stock.

In addition to the prevention of infection by these means, there are at the disposal of stockowners other means of protecting their stock from the ravages of disease. Hence, at the first evidence of any ill-health, expert advice should be sought so that the condition may be controlled before it becomes widespread. Frequently, the products of laboratory and field investigation are of value in preventing disease. Thus blackleg of calves may be prevented by vaccinaton or the injection of "aggressin." Vaccination is of great help in controlling contagious mammitis, inoculation checks contagious pleuro-pneumonia, anthrax is prevented by vaccine, and so on.

Most Diseases are Associated with Insanitary Conditions.

In concluding it is necessary to stress the importance of observing the principles of hygiene and sanitation. Cleanliness, we are told, is one of the cardinal virtues, and it is certainly closely related to healthiness.

If greater efforts were made to free animal premises from dirt and flies by the use of plenty of water and "elbow grease," the establishment of an effective drainage system, and the surfacing of yards, the cow bails, sheds, and pens would not only be less likely to retain the germs of infectious disease, but would be far more pleasant places to work in.

It is well to remember that most of the diseases which affect young animals are associated with insanitary conditions. Pigs and calves are frequently shut up in yards that are filthy, and in ramshackle sheds that are an offence to the eyes and the nose. Young animals kept under such conditions rapidly develop disturbance of the digestive system, and those which do not die remain stunted in growth.

As a final word, let me say that the prevention of most infectious diseases rests to a large extent upon the exercise of common sense and the application of principles of cleanliness and sanitation which are known to us all.

Dundee Superior to Federation in Yield, Grain Quality and Disease Resistance.

THE efforts of Mr. J. T. Pridham to do what even Farrer suggested was unlikely to be accomplished, namely to combine high yield and high baking quality in a wheat, would seem to have been partly rewarded at least in the production of Dundee, which has already proved to be far superior to Federation in yield, grain quality and disease resistance. Local baking tests have already indicated the improved quality of Dundee and this has been corroborated by Dr. Kent Jones, England, who states that Dundee is a decided improvement in general strength (i.e., baking quality) over even good commercial Australian wheat. No one would ever have been bold enough to prophesy that a wheat of such quality would have been produced which was capable of yielding many bushels more than Federation, yet the following figures from field trials at Cowra Experiment Farm show it to have averaged over 8 bushels per acre more than Federation during the past five years:—

	1928.		1929.		1930.		1931.		1932.		Average.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Federation	21	24	10	0	27	15	37	12	39	17	27	4
Dundee	28	17	14	25	46	55	41	31	46	2	35	26

On account of its productiveness, disease resistance and other generally good field characters, which are the chief qualities by which wheat growers judge a variety, Dundee is destined to make considerable headway in cultivation in New South Wales and perhaps also in other States. With the development of wheats of such grain quality, the British miller will find that Australian wheat will show some improvement in general strength and he will be able to use it more freely in his blend.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
Liverpool State Hospital, Liverpool ...	72	3 April, 1933
Lidcombe State Hospital and Home ...	149	3 „ 1933
P. M. Burtenshaw, Killean, Inverell ...	66	6 „ 1933
J. P. McQuillan, Bethungra Hotel, Bethungra ...	20	6 „ 1933
A. D. Frater, "Fairview Dairy," Inverell ...	51	6 „ 1933
A. H. Pye, Loch Levan, Inverell ...	47	7 „ 1933
W. Newcomb, "Minnamurra," Inverell ...	72	7 „ 1933
Rydalmere Mental Hospital ...	77	7 „ 1933
Miss Brennan, Arankamp, Bowral ...	17	8 „ 1933
G. W. Young, "Boorganna," via Wingham ...	41	10 „ 1933
St. Joseph's Girls Orphanage, Kenmore ...	11	13 „ 1933
St. Joseph's Convent, Reynold-street, Goulburn ...	3	14 „ 1933
St. Michael's Novitiate, Goulburn ...	4	14 „ 1933
Marion Hill Convent of Mercy, Goulburn ...	47	15 „ 1933
Newington State Hospital and Home ...	100	17 „ 1933
G. A. Parish, Jerseyland, Berry ...	93	21 „ 1933
Riverina Welfare Farm, Yanco ...	89	24 „ 1933
Department of Education, Yanco Agricultural High School ...	39	24 „ 1933
Lunacy Department, Kenmore Mental Hospital ...	80	27 „ 1933
Australian Missionary College, Cooranbong ...	72	5 May, 1933
W. M. McLean, Five Islands Road, Unanderra ...	76	6 „ 1933
Koyong School, Moss Vale ...	3	11 „ 1933
Tudor House School, Moss Vale ...	21	13 „ 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus) ...	226	2 „ 1933
W. Hammond, Bellingen ...	77	16 „ 1933
Hurlstone Agricultural High School, Glenfield ...	44	22 „ 1933
E. C. Nicholson, Jillamatong, Corowa ...	180	23 „ 1933
St. John's College, Woodlawn, Lismore ...	47	23 „ 1933
Grafton Experiment Farm ...	271	14 July, 1933
P. Ubrihien, Corridgeree, Bega ...	123	15 „ 1933
William Thompson Masonic School, Baulkham Hills ...	37	20 „ 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 „ 1933
G. V. Ralston, "Porphyry," Seaham ...	98	21 „ 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook ...	37	17 Aug., 1933
A. L. Logue, Thornboro, Muswellbrook ...	36	17 „ 1933
E. W. Flower, Binna Burra ...	56	18 „ 1933
E. P. Perry, Nundorah, Parkville (Guernseys) ...	30	25 „ 1933
Chapman Bros., Farm 166, Stoney Point, Leeton ...	43	25 „ 1933
Sacred Heart Convent, Bowral ...	10	26 „ 1933
Lunacy Department, Parramatta Mental Hospital ...	12	1 Sept., 1933
Department of Education, Gosford Farm Homes ...	38	2 „ 1933
James McCormack, Tumut ...	98	9 „ 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	67	16 „ 1933
G. Powell and Sons, "Loch Lomond," Armidale ...	22	26 „ 1933
E. S. Cameron, Big Plain, Narrandera ...	31	26 Oct., 1933
E. E. McMullen, Springnook, Holbrook ...	31	3 Nov., 1933
W. R. Boughton, Holbrook ...	33	3 „ 1933
C. Maynard, Holbrook ...	12	3 „ 1933
Lunacy Department, Callan Park Mental Hospital ...	31	20 „ 1933
Stace Bros., Taylor-street, Armidale ...	26	1 Dec., 1933
J. L. W. Barton, Wallerawang ...	20	1 „ 1933
Department of Education, Brush Farm, Eastwood ...	8	3 „ 1933
Lunacy Department, Morisset Mental Hospital ...	27	7 „ 1933
W. W. Martin, "Narooma," Urana Road, Wagga ...	150	14 „ 1933
J. F. Chaffey, Glen Innes (Ayrshires) ...	58	15 „ 1933
E. E. Winder, Wybong Road, Muswellbrook ...	40	22 „ 1933
C. J. Parbery, Allawah, Bega ...	108	8 Jan., 1934
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay ...	8	9 „ 1934
G. H. Hooper, Oak Hill, Bethungra ...	10	19 „ 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	80	22 „ 1934
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell ...	13	27 „ 1934
J. B. Burtenshaw, "Sunnyside," Inverell ...	42	27 „ 1934
Parker Bros., Hampton Court Dairy, Inverell ...	82	27 „ 1934
New England Experiment Farm, Glen Innes (Ayrshires) ...	41	28 „ 1934
Bathurst Experiment Farm (Jerseys) ...	31	1 Feb., 1934
W. K. Frizell, Rosenstein Dairy, Inverell... ...	37	2 „ 1934
W. Pigg, Redlands Dairy, Inverell ...	27	2 „ 1934
New England Girls' Grammar School, Armidale ...	29	3 „ 1934

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
A. N. de Fraine, Happy Valley Dairy, Inverell	28	3 Feb., 1934
G. L. Genge, "Easton," Armidale	39	7 ,, 1934
J. Davies, Puen Buen, Scone (Jerseys)	191	9 ,, 1934
Forster & Sons, Abington, Armidale	189	12 ,, 1934
A. B. Finney, Fox Ground, Gerringong	33	17 ,, 1934
Lunacy Dept., Gladesville Mental Hospital	34	22 ,, 1934
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 ,, 1934
St. Patrick's College, Goulburn	8	21 Sept., 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 ,, 1934
Wagga Experiment Farm (Jerseys)	53	25 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone	92	9 Nov., 1934
Wolaroi College, Orange	11	10 ,, 1934
Wollongbar Experiment Farm, Lismore (Guernseys)	123	11 Jan., 1935
George Rose, Aylmerton	2	21 Feb., 1935
Mittagong Farm Homes	36	22 ,, 1935
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	18	23 ,, 1935
T. H. Maples, Racecourse Farm, Bega	38	2 Mar., 1935

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis :—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—MAX HENRY, Chief Veterinary Surgeon.

Abortion-free Herds.

THE following herd has been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free, and unless otherwise declared this certification remains in force until the date shown :—

Owner and Address.	Number in herd.	Expiry date.
Martin Bros., "Narooma", Urana Road, Wagga Wagga	86	28 Feb., 1934.

—MAX HENRY, Chief Veterinary Surgeon.

INFECTIOUS DISEASES REPORTED IN FEBRUARY.

THE following outbreaks of the more important infectious diseases were reported during the month of February, 1933 :—

Anthrax	Nil.
Blackleg	3
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	Nil.
Swine fever	Nil.
Contagious pneumonia	Nil.
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

Beekeepers, It's Up to You!

Agents Have Few Facilities for Processing and Blending.

W. A. GOODACRE, Senior Apiary Instructor.

LIKE any other commodity, if honey is to command good prices it must be of first-class quality and attractively presented. Under the new marketing conditions selling agents have no extensive resources for processing and blending, and it is more than ever necessary, therefore, that careful attention be paid to the preparation of his product by the apiarist himself.

THERE are few buyers of honey nowadays who are not keen judges, and the poorly-processed article is invariably passed by. Yet a good deal of such honey could very easily have been brought into the category of choice quality. Processing, after all, is only a simple matter. Its successful performance calls primarily for care.

What may be termed the preliminary steps in processing are carired out by the bees. The nectar gathered from the flowers is treated in the honey stomach of the insect during the homeward flight, and changed into honey. The house bees in the hive carry the work further, removing excessive moisture and adding certain elements until the requisite density and composition is obtained. When this stage is reached the bees seal the honey in the cells of the comb.

Don't Rush Extraction.

It is essential that this procedure should not be interfered with. To rush the work of extraction, taking more than a small percentage of "green" honey, means that a product is harvested which is likely to cause trouble from fermentation if held, and when sent to market is always a source of worry. At least three-quarters of the combs should be sealed before the honey is extracted. In order that the bees may store their full quota of honey and that the ripening process may be completed, it is important to have on hand ample supplies of surplus combs.

Procedure in Processing.

Honey, when first drained from the honey extractor, contains a certain amount of wax pieces; it is, therefore, advisable to have a strainer fitted to the top of the honey tank. The honey is then strained before entering the tank. When the tank is filled it should be securely covered, and a sound piece of cloth put over the lid and fastened by strong string twitched tightly round the ledge; this offers protection from insects or stray ants that might happen to gain access to the tank—the lid itself rarely fits as tight as is desirable. The tank being thus filled and securely covered, the honey should be allowed to remain for about four days, during which time it will clear and will also go through some ripening process by evaporation of moisture.

At the end of four or five days, if care has been taken in the first instance to have the honey well sealed by the bees, the apiarist will have a clear, refined product that has, in the first place, been ripened by the bees, then strained and allowed to clear, and further improved by ripening in the tank. If, during warm, dry days, the apiarist is working about the honey house, a further improvement in the ripening will take place if the covering is removed from the tank for a time. Of course, this is not practicable if there is any chance of bees, etc., getting into the honey. The covering should be replaced towards afternoon.

When preparing to tin off, the honey should first be skimmed and then drained off into the containers in which it is to be marketed. When the honey is low in the tank, the apiarist can tilt the tank towards the tap; this will allow a further quantity to come out clear. When all the clear honey has been tinned off, the remainder, which will contain a certain quantity of wax pieces, can be drained into a small vessel with a honey gate at the bottom; this honey, if warmed, will clear quickly, and can be tinned off down to the wax pieces, etc., which are in the form of scum.

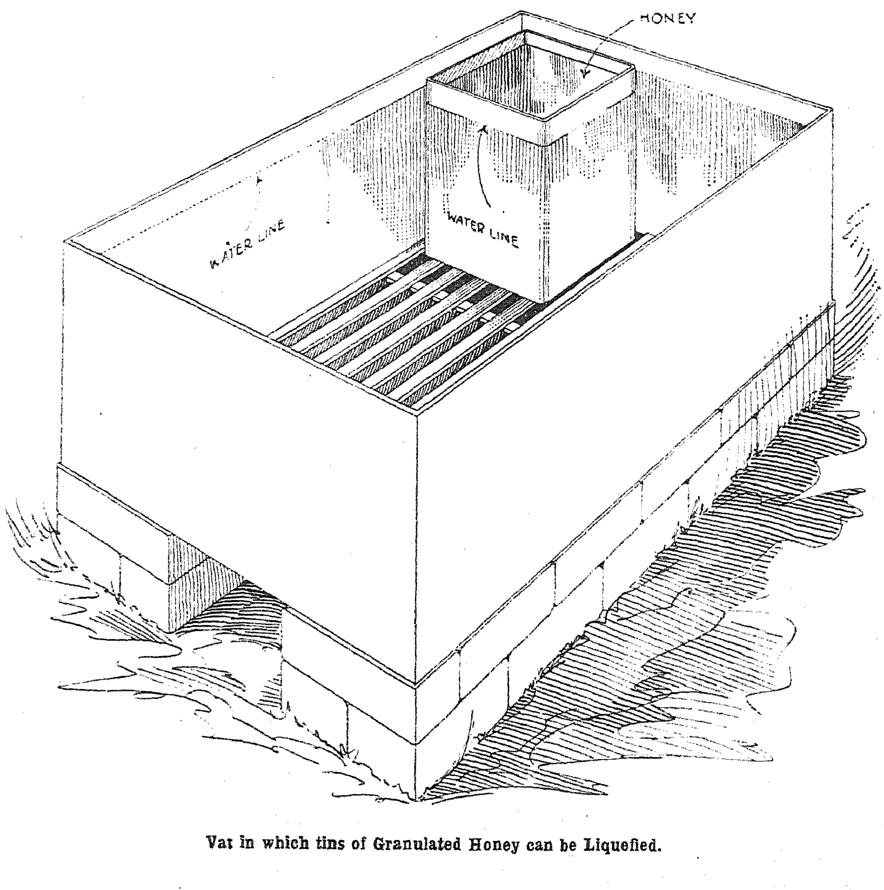
Heating Honey.

The above is the usual and effective method for the treatment of extracted honey. In some cases it is desired to heat honey for the purpose of giving it a brighter appearance and extra density, and also for blending purposes. The question of heating honey is best left to the individual apiarist, who will be guided by the taste of his customers, or the quality desired for market. Honey that has gone through a correct heating process will no doubt appeal to many on account of its appearance and density.

The correct time for heating honey largely depends on when the apiarist desires to dispose of his crop. For instance, if the honey is to be sold within a few weeks, it will be advisable to combine the heating with the extracting work, but where it is intended to hold for an improved market (usually the winter) it is advisable to wait until near the time of despatch, for the honey may granulate while in store even after the first heating, and it is then necessary to heat it again. This double heating process is likely to be detrimental to the quality.

If the apiarist is working on a fairly large scale and desires to market early, it is advisable to install a patent honey heater, which can be purchased. The object is to run the honey from the extractor through this apparatus, and to heat it to about 150 degrees Fahr. before it goes into the tank. After such treatment the honey clears very quickly and is less likely to granulate within a reasonable period. In the case of the small apiarist, when it is desired to heat honey the containers may be put in a vat used for liquefying granulated honey (see illustration), and heated to about 150 degrees, and the warm honey then returned to the honey tank for complete processing.

A common fault is insufficient tank accommodation for thorough clarification of the honey after extraction. As a result, instead of the honey being allowed about four days to clear, it has to be tinned up within perhaps a day or two. The consequent loss to the beekeeper through impaired quality of the product is more than the cost of many tanks. The only case in which honey may be tinned up soon after extraction is when a heater is used, but it is usually only on rather large commercial farms that a heater is employed. Careful note should be made of the prospects of the flora, and ample



Vat in which tins of Granulated Honey can be Liquefied.

preparation made in the way of tank accommodation. Where honey has to be rushed through the tanks it would pay before sending it to market to take the first opportunity of repairing the effect of such hasty treatment. This only means warming up the honey, pouring it into the tanks again, and allowing it to clarify properly. Before despatch of honey to market the producer should place himself in the position of a buyer and test every tin consigned—it is the safest way.

To Liquefy Granulated Honey.

Although it is quite possible to keep honey in a liquid form for a fair period by storing it in a warm room kept at an even temperature, there appears to be no practicable method that can be described as an absolute preventive of granulation (candying). Some honey has a tendency to granulate more quickly than other honey. For instance, in New South Wales the honey from the peppermint (*E. amygdalina*) will readily granulate, while that from yellow box (*E. melliodora*) and ironbark will usually remain liquid for a considerable period. Some honey will granulate with a coarse grain, while other will have grain as fine as icing sugar. Clover and lucerne honey has a very fine grain when granulated, while that from some of our eucalyptus gums has a coarse grain. Granulated honey can be liquefied by immersing the tin in water heated to 150 degrees Fahr., and if the operation is carefully carried out the quality is not affected materially in this first heating.

Where a small quantity is to be treated, a single-walled vat to hold six or eight tins can be set upon bricks so that a fire can be placed underneath (see illustration). A wooden frame is placed in the vat to prevent the containers from coming in contact with the bottom, and water is poured in to about 3 inches from the top of the containers. The water should not be heated above 150 degrees—about what one can bear the hand in for six seconds. Semi-granulated honey can be liquefied in about six hours, while hard granulated honey will take about twelve hours. Care must be taken when handling honey in this vat not to depend on the handles of the containers, but to have a few holders made so as to fit right round the tin. Another thing to remember when honey is to be stored for a period that may allow it to granulate is not to fill the containers right up, for during the heating the honey will expand.

When larger quantities have to be liquefied it is advisable to have a small steam boiler and a vat to hold about fourteen to sixteen tins. A pipe will deliver the steam into the water in the vat to keep up the temperature; this is regulated by a steam cock to supply the desired volume. The usefulness of a steam boiler in a large apiary cannot be over-estimated, and second-hand ones are often obtainable at no great outlay. Steam can be supplied for keeping the water hot in the cappings reducer, cleaning honey tins, and melting up wax and old combs. It is also an economical power if an engine is fitted for sawing purposes, etc.

Greater care should be exercised in the liquefying of granulated (candied) honey. The apiarist working a small liquefying plant is inclined to hurry the process by over-heating. Honey should not be heated above 150 degrees Fahr. if its finer qualities are to be preserved. As an indication of the importance of care in this connection it may be mentioned that certain countries will not permit importation of honey which has been over-heated. Such honey, on account of the change in its composition, is even liable to be classified as impure.

The process of liquefying should take place just previous to the marketing of the honey.

For convenience in marketing or blending, each class of honey should be marked and kept separate.

Care of Extracting Utensils.

important factor in relation to quality in honey is the condition of
acting and other utensils and the containers in which it is stored.
isils are out of commission during the greater portion of the year,
hould be taken to see that they are clean and free from rust before
Permanent damage is sometimes caused to honey by the admix-
gnate of iron, a black substance resulting from the chemical reac-
honey on the surfaces of extractors or tanks the galvanised coat-
ng of which has begun to wear off. Where the rusting is only
damage may be minimised by coating those parts which come in
the honey with beeswax. The use of paint for such internal
wever, cannot be advised. After use, all apparatus should be
washed in hot water, dried, and protected from moisture and

Appearance of Honey Containers.

pearance of the honey container has quite an important influence
. It is not surprising that the buyer should pass "bumped-up"
ers or those having a poor appearance if sound bright lots are avail-
It is recommended that only new honey tins be used. If the outside
the tin becomes dull through being kept in store, it may be greatly
improved by a coat of aluminium paint. Tins with screw tops are the best, as they are more convenient for the buyer when testing.

When sending honey a distance by rail it is advisable to put the tins in crates. Strong cleats nailed across the ends of the cases near the top add strength, and form convenient hand holds. Where it is desired to consign uncrated, personal attention should be given to the loading of the truck, so that the tins may be packed carefully, and in such a manner that no other produce is dumped roughly on top of them.

Storage of Honey.

If honey is stored in a damp place and not thoroughly sealed up it will absorb moisture, and if excessive moisture is so taken up the honey is liable to ferment and deteriorate in value. When storing, whether in tins or tanks, care must be taken to have the vessels thoroughly sealed down.

To Refine Beeswax.

To refine beeswax, quarter fill a fair-sized tinned vessel with water, add the blocks of wax, and heat until they are thoroughly melted. Withdraw the fire, and allow the vessel to stand (well covered) until impurities have time to settle. The wax is then drained off from the top into suitable moulds

until the underlying impure matter is reached. The moulds should have flanged sides and should have previously been smeared with glycerine, and when filled with wax should be placed in warm water to ensure slow cooling. When properly cooled off, the wax is removed from the moulds and any adhering impurity scraped off.

When larger quantities of wax are to be refined, steam and a spec designed cask are necessary.

A Booklet Every Beekeeper Should Have.

For more detailed information on the subjects dealt with in it readers are referred to Farmers' Bulletin 129, "The Beginner ture." This publication discusses not only the processing of beeswax, but all the various aspects of commercial apiculture. able from the Department of Agriculture, Box 36A, G.P.O., 1s. 1d. (postage included).

Selected Citrus Buds.

The Co-operative Bud Selection Society, L

For some years it has been recognised that in most citrus groves there are tr rarely produce sufficient fruits to be payable, whilst other trees are more constan ducers of good quality and payable crops, so that with a view to enabling nursery to supply trees of the most productive and remunerative standards to planters, the abo Society was formed under the ægis of the Department of Agriculture, and consists representative fruitgrowers and nurserymen. The Society *does not and cannot m profits*, but merely exists to improve the fruit-growing industry by making available budding selected buds from special trees of the best types of quality fruit and of repu good bearing habit only. Trees from such buds should undoubtedly be more profitabl and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1932 budding season, trees from which should be available for planting during the 1933 planting season :—

Nurseryman.	Oranges.		Eureka. Lemon.	Marsh. Grape-fruit.	Total.
	Washington Navel.	Valencia.			
L. P. Rosen and Son, Carlingford...	4,000	4,000	1,000	1,000	10,000
T. Adamson, Ermington	1,500	1,500	500	250	3,750
A. T. Eyles, Rydalmere	2,000	1,000	...	...	3,000
H. J. Ferguson, Wyong	...	200	...	...	200

—C. G. Savage, Director of Fruit Culture.

To Control Brown Spot of Passion Fruit.

R. J. BENTON, Special Fruit Instructor, and G. B. BARNETT, Fruit Inspector, Grafton.

THE results of spraying experiments carried out at Grafton Experiment Farm during 1932 and the early part of this year confirm the Department's existing recommendations for the control of brown spot of passion fruit, insofar, at any rate, as they demonstrate the effectiveness of applications of Bordeaux mixture (6-4-50) at regular intervals after first pruning the affected vines. The idea of regular applications is to keep the growing parts of the vines protected by a covering of spray.

The vines on which the trials were carried out were planted in the summer of [illegible] in eight rows 11 feet apart, each row averaging twenty-five vines 1[illegible] feet [illegible] inches apart, the vines being trellised on two parallel wires on the [illegible] of posts standing 5 feet out of the ground.

FREE LEAFLETS.

Of Interest to Passion Fruit Growers.

The Passion Fruit.
Brown Spot of Passion Fruit.
Sclerotinia Rot of Passion Fruit.
Woodiness of Passion Fruit.
Bordeaux Mixture.

After maturing a crop in the midwinter of 1932, the vine growth was very dense and the disease was prevalent. In July the vines were pruned to eliminate as much diseased material as possible, as well as to reduce the quantity of old growth. Commencing in August, 1932, four rows of vines were sprayed regularly (every month up till mid-January) with Bordeaux, and four were left unsprayed for comparison.

During October the brown spot disease made its appearance on the untreated vines, and increased at such a rate that by the middle of December the vines had lost most of their foliage and a large quantity of the fruit produced on these unsprayed vines was unmarketable. By early January practically all the foliage had become affected and 50 per cent. of the fruit was destroyed. On the other hand, the Bordeaux-sprayed vines remained practically disease free and the loss of fruit was negligible.

How Much Spray Per Acre?

Naturally the amount of spray used will depend upon planting distances, amount of vine growth and the efficiency of the spraying outfit. If the vines have been pruned severely, about 20 gallons of spray is usually sufficient for an acre, but the quantity will have to be increased as the vines make growth, 70 to 80 gallons per acre per application being required when the vines have developed fully. Based on the total quantity used during the trial, it is estimated that 400 to 500 gallons (costing £1 for copper sulphate, and 3s 6d. for lime) would be required to spray an acre at the suggested intervals from pruning time until the following May.

Bordeaux spray marking on the mature fruit is rapidly and effectively removed by immersing the harvested fruit for a few seconds in an acid solution—either hydrochloric, citric or tartaric acid diluted to a strength of about 4 oz. in 10 gallons of water.

A point of interest in connection with the experiment was that the fruit on the sprayed vines matured almost two weeks earlier than that on the unsprayed vines. It is not possible to say whether the spray hastened maturity, but it is intended to keep this matter under observation in subsequent trials.

Grazing Crops for North Coast Dairy Farmers.

TRIALS to determine the most suitable winter grazing crops for north coast dairy stock were again carried out last year at Wollongbar Experiment Farm, near Lismore, by the Experimentalist, Mr. G. Giles. The crops were sown on 21st April, using 100 lb. seed per acre in the case of oats and rye, and 15 lb. grass seed.

Results during the past two years point to Black Winter rye being the heaviest yielder, but the harsh nature of this plant militates against its more general use. As a grazing proposition Buddah oats is proving equal, if not superior, to the standard variety Algerian, and it also has the added advantage of being earlier. Italian Rye grass has also proved a heavy yielder, and in addition it lasts well into the spring, producing the best quality feed of all the varieties under trial. The yields in last year's trials were:—Algerian oats (standard) 8 tons per acre, Italian Rye grass 9 tons 1 cwt., Black Winter rye 7 tons 18 cwt., Buddah oats 7 tons 17 cwt., Guyra oats 5 tons 5 cwt., and Prairie grass 2 tons 15 cwt.

A Guide to Beekeeping.

THE successful management of bees, whether commercially or as a hobby, calls for knowledge of the habits of the bees and of up-to-date methods of apiculture. Those considering starting in this interesting and, when properly conducted, profitable activity would do well to purchase "The Beginner and Bee Culture," Farmers' Bulletin No. 129 of the Department, which is obtainable, price 1s. 1d. posted, from the Under Secretary, Box 36A, G.P.O., Sydney. It discusses in a very clear and concise manner the queen and her subjects; their habits and the methods of rearing bees; the hives and materials used; the extraction of honey and the making of beeswax; the diseases, pests and enemies of bees; and many other matters with which it is necessary that the apiarist be conversant.

Orchard Notes.

April.

C. G. SAVAGE and W. le GAY BRERETON.

Careful Picking and Packing Pays.

THE harvesting of late varieties of apples and pears is still in progress. The picking of fruit is an operation which needs to be carried on with the greatest care if satisfactory results are to be obtained. Even growers who are most careful with all the other orchard work are less careful than is desirable in fruit picking. Nothing should be done to injure the skin of the fruit; it is essential that it be kept in sound condition, so that it may present an unblemished front to agents of decomposition. Fruit may be injured by dropping it carelessly into picking bags, by tumbling it roughly into boxes, by carting it carelessly over rough roads; it is absolutely essential (and this cannot be too strongly emphasised) to pick, handle, and pack fruit with care if it is to arrive at the market in good condition.

So far as packing is concerned, it is necessary to avoid packing fruit so loosely that it allows movement in the case, or so high that bruising is unavoidable when the lids are nailed on.

Some Codling Moth Reminders.

Destroy Moth-infested Fruit.

It is pleasing to note that the depredations of the codling moth were not so great this year as last. This should not lead growers to lessen their efforts to cope with the pest; it should rather make them determined to persevere with stringent measures so as to get as near as possible to complete extermination of a destroyer which exacts heavy toll if not kept in check.

The most important phase in connection with moth control this month is the destruction of infested fruit. It must be borne in mind that it is the carry-over grubs which start next season's infestations. It is of paramount importance to attend thoroughly to the destruction of infested fruit. If this is not gathered and promptly destroyed at short intervals many grubs escape and get into sheltered positions where they winter-over unnoticed, even though a most diligent search has been made by the grower with the object of destroying as many as possible. It is evident that the best results can be achieved, especially in closely-settled districts, only by the united efforts of all apple and pear growers; spasmodic and sectional efforts cannot produce the best results.

The bandages should be regularly examined and any harbouring grubs killed. The bandages should be left on until well into the winter, by which time all the fruit has been removed from the trees. At this season there is often a movement of grubs to the bandages from less favourable hiding places. Such grubs can be killed when the bandages are examined late in the winter.

Clean Up the Packing Shed.

When the last of the crop has been despatched the packing shed should be given a thorough clean-up. All receptacles, cases, sacking, etc., that have been used for holding fruit should be dipped, if possible, by wholly submerging them in boiling water for three minutes. Bins, benches, sizers, etc., that cannot be dipped should be thoroughly searched for any hiding codling grubs, special care being taken to probe all cracks, holes, or joints. Where canvas or sacking forms part of the packing equipment, hemmed and frayed edges should be searched. If the sacking is old it is best to replace it with new material and burn the old stuff.

As an aid to moth control it is a great advantage to have all packing sheds and fruit stores so constructed that they can be made moth-tight. Then at the end of winter they can be closed and any moths emerging in the spring and early summer from imprisoned grubs can be destroyed as they are attracted to the windows by the light.

To Control Scale Insects and Shot Hole.

Scale Insects.—Fumigation may be continued during April, but growers would be well advised, if they desire that the fruit should be free from red scale by the time it is ready for picking, to finish the work as soon as possible. The completion of the work at an early date is also desirable if white wax is present. A leaflet on fumigation can be obtained free from the Department.

Shot-hole of Stone Fruits.—Where shot-hole of stone fruits has been present, such as on apricots and peaches, spraying with Bordeaux mixture (6-4-22) should be commenced when the leaves start to fall from the trees in the autumn.

Autumn Cultivation.

When a cover crop has not been sown for green manure it is an excellent plan to give the orchard an autumn ploughing. This practice is specially recommended for the drier inland districts where water is not available for irrigation. The plough is to be preferred to the cultivator, as it puts the land in a more suitable condition to absorb and retain any rain that falls, while in addition the soil does not crust or set so readily after ploughing.

If it is intended to plant an additional area, it is wise to have it ploughed and subsoiled as early as possible, so as to allow the first good rains to soak in well, after which planting can be carried out when desired during the

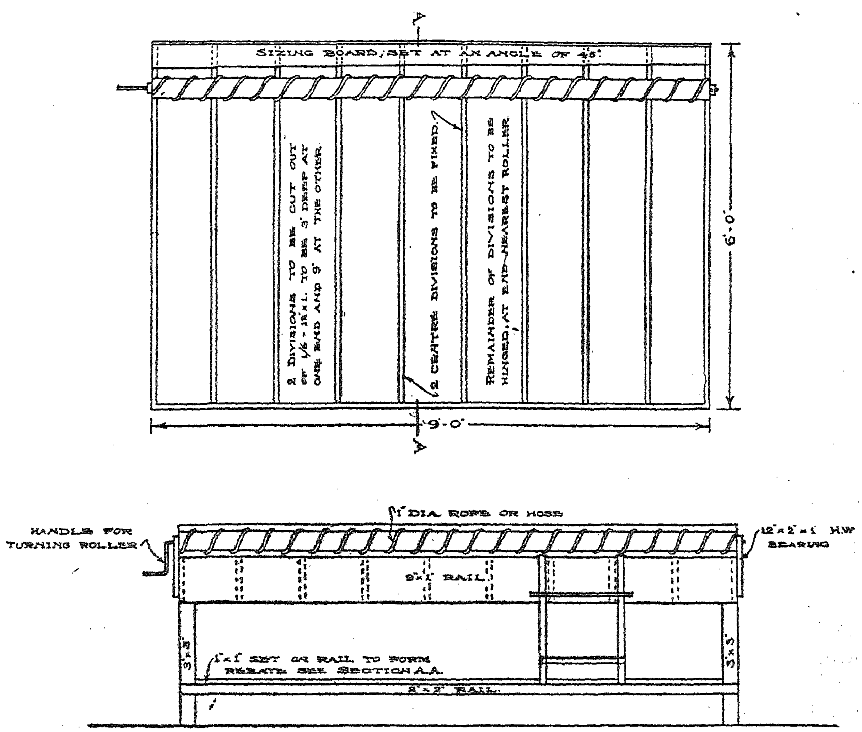
planting season. On the other hand, if the land is left in an unbroken condition rain is not readily absorbed, and, should a dry winter follow, successful planting may not be possible.

Sometimes the new land is soft enough to plough, but not sufficiently soft to subsoil. In such cases it is advisable, first, to plough in order to allow the rains to soak in and soften the soil, after which it can be cross-ploughed and subsoiled.

Provided the land is not too wet the present is a good time to carry out re-soiling in the orchard.

Citrus Harvest Commences Next Month.

The methodical grower will already have begun to make preparations for the citrus harvest, which commences with the early varieties in the early districts next month. Special attention should be paid to the sizing



Plan and Elevation of Fruit-sizing Machine.

machine to see that it is in good working order. If any grower does not possess such a machine there is still ample time to construct one, and this is quite a simple task for the handy man, particularly if armed with full instructions, such as are available free of charge in pamphlet form from the Department of Agriculture. Uniform and accurate sizing is of the greatest assistance to rapid and better packing.

Planting Citrus Trees.

In situations that are not liable to autumn frosts, and where the soil is in a good, moist condition, citrus trees may be planted during this month. There are certain precautions to be observed—precautions which, though obvious, are sometimes neglected. The roots should be thoroughly protected against the sun and wind during transference of the tree from nursery to orchard, and weaklings should be unhesitatingly rejected. Only those trees which are strong and are possessed of a good root system should be chosen. Before planting, all broken roots should be cut away cleanly and dipped in a puddle. Plant the young trees at the same depth as they grew in the nursery.

Importance of Shelter in Banana Growing.

THE increasing production of bananas makes it more than ever essential that plantations should be established only under the most favourable conditions. In this relation the question of shelter is one of first importance. The value of shelter from southerly and westerly winds cannot be too strongly stressed, for it is an essential factor in the future productivity and permanence of a plantation. Too little attention is given to this question. Where, as is sometimes the case, bananas are planted on exposed hillsides, it is not surprising that only moderate results should be obtained.

Almost the whole of a banana plant is composed of leaf matter. The broad undivided leaf of the plant shows that its natural habitat must have been in sheltered regions, where the leaves would be protected from boisterous winds. Hence it may be inferred that a windy situation is not suitable if large bunches and well developed fruit are desired. Bananas depend almost as much on their leaves for nourishment as on the root system itself. The leaf, by means of the green colouring matter (chlorophyl) it contains, is able to utilise the energy of the sun's rays in the building up of the food required by the plant for growth and development. The water in the soil, together with the mineral plant-foods in solution, is absorbed by the roots and carried to the leaves, and there, with the carbonic acid gas of the air, the various organic compounds are elaborated by the plant. The compounds as manufactured are then transferred and used where required, or are stored up in the bulb for future use.

This consideration of the functions of the leaves shows how seriously heavy destructive winds, by cutting the leaves into ribbons, must interfere with the performance of the part they play. Shelter, it will be seen, is necessary for the proper feeding of the plant; in fact, given good shelter, a grower will get better returns from soil that is not so good than from better soil where the area is exposed to either westerly or southerly winds. Direct heavy losses of bunches and severe damage to plants by uprooting and blowing over are not unlikely to happen in a few hours in exposed positions during gales or severe windstorms. For banana growing purposes good shelter increases the value of land at least fifty per cent.; that is to say, land with good shelter is worth at least half as much again as similar land which is exposed to prevailing winds. Wherever possible advantage should be taken of the natural timber by leaving sufficient standing for effective windbreaks on the southern and western sides.—H. W. EASTWOOD, Senior Fruit Instructor.

Cod Liver Oil in the Diet of Young Chickens.*

W. J. B. MURPHY, B.V.Sc., Veterinary Surgeon, Stock Branch.

IN addition to the nutritive elements of a chicken's ration, such as protein, starch and fats, vitamins are of outstanding importance. Vitamin A is essential for growth and the maintenance of health, while vitamin D is essential for normal bone formation. In the absence of vitamin A growth ceases and the subject is rendered more susceptible to disease; when vitamin D is absent, normal bone formation is supended and the disease known as rickets becomes manifest, this latter occurring even in the presence of ample mineral supplement in the ration.

The natural source of vitamin A to chickens is fresh green feed, and to a lesser extent fresh cows' milk. Natural foods contain no vitamin D, but if chickens are exposed to the direct rays of the sun they are endowed with the power to "manufacture" within their bodies their own supply of this vitamin.

Cod Liver Oil as a Substitute for Sunshine.

Under commercial poultry-farming conditions, chickens are far removed from their natural state. Within the last few years also the battery brooder has been extensively adopted. This structure consists of several wire-floored compartments, usually arranged in tiers, and housed in a special brooder-house. The chickens are confined in battery brooders for three to four weeks, and during this period are therefore deprived of their natural source of vitamin D.

With the more orthodox types of brooders it is often necessary to confine the chickens indoors for extended periods. For example, in September, 1932, a three-weeks' period of practically incessant rain occurred, with sunshine on only three or four days in that period. Chickens, of course, could not be let out as usual, and even when not raining there was little if any sunshine to benefit them. As a result losses from rickets were enormous.

It will be seen consequently that under such conditions vitamin A, and vitamin D more particularly, must be supplied. This may be done in one of two ways: (1) Exposure of the chickens to artificial ultra-violet irradiation, (2) administration of cod liver oil in the ration. The former supplies only vitamin D, but the latter both A and D. The latter, moreover, is more economical and easier adopted by poultry-farmers.

*The experimental work recorded in this paper was undertaken at the Glenfield Veterinary Research Station.

Experiment to Test Value of Oils.

To test the relative value of various commercial cod liver oils available to poultry-farmers, samples were purchased and fed to young chicks kept under such circumstances that, the supply of vitamins A and D being deficient, the birds would not grow and would develop rickets.

Day-old Black Orpington chickens were obtained from a well-known hatchery, and when two days old were weighed and divided between six specially erected pens. All pens were given the following ration, *ad lib*:—Crushed oats 20 per cent., wheat meal 20 per cent., pollard 32 per cent., bran 16 per cent., skim-milk powder 10 per cent., meat meal 5 per cent., bone meal 1 per cent., salt 1 per cent., the nutritive ratio of which is 1 : 3.5 approximately.

The house in which the chickens were kept was specially prepared to admit of ample ventilation, but no direct sunlight. The experimental pens were arranged as follows:—

Pen 1—Cod liver oil, sample A.
Pen 2—Cod liver oil, sample B.
Pen 3—Cod liver oil, sample C.
Pen 4—Cod liver oil, sample D (laboratory supply).
Pen 5—No oil supplement, but the birds were given fresh green feed each day and exposed to direct sunshine for about five hours daily.
Pen 6—No oil supplement, no sunshine, and no green feed.

Each oil was added, daily, at the rate of 1 per cent. to the mash. The trial commenced on 1st October, 1932, and concluded on 25th October, 1932.

Observations on the Health of the Chickens.

Observations on general health were made on every third and fourth day alternately, and each bird was weighed at intervals of approximately one week.

(*a*) *General Health.*—With the exception of those chickens in Pen 6, the general health of all other birds remained quite satisfactory throughout the experiment. Those in Pen 5 were at all times outstanding in size, vigour, bloom and general health. When the birds in Pen 6 were sixteen days old, *i.e.*, eleven days after the experiment started, typical rickets made its appearance. This disease, due to absence of vitamin D, is characterised by cessation of growth, abnormal "stilted" gait, diarrhoea, inability to stand, and death after one to seven days' sickness. Birds affected with rickets can stand only with difficulty, swaying to and fro on account of the soft nature of their bones; the leg and wing bones bend easily in the fingers and do not snap cleanly like healthy bone; the beaks are soft and often crossed. Throughout the course of these symptoms the affected birds remain more or less bright and show a desire to eat. All birds in Pen 6 were affected in a similar manner, and the last one died when twenty-seven days old. It was of very stunted appearance and had lingered for some days.

(*b*) *Growth and Development.*—All chickens were weighed at the beginning and on the first, fourth, eleventh, twentieth, and twenty-fifth days of the experiment, the average weight in grammes of each pen of birds on these days being as follows:—

TABLE Showing Weights at Various Intervals.

	1st day.	4th day.	11th day.	20th day.	25th day.
	grms.	grms.	grms.	grms.	grms.
Pen 1	37·9	57	82·2	118·3	194·5
,, 2	41·3	55·5	84·1	125·6	183·1
,, 3	39·3	55·1	86·5	137·7	199·7
,, 4	39·5	52·6	87·7	142·5	216·0
,, 5	40·8	55·4	89·5	146·5	220·4
,, 6	38·8	54·3	67·9	86·5	83·0

Fig. 1 illustrates the above table graphically.

It will be noted that the birds in Pen 6 had commenced to show lack of growth by the eleventh day, and from then on were always much below the others. From the same date onward, Pen 5 showed to advantage.

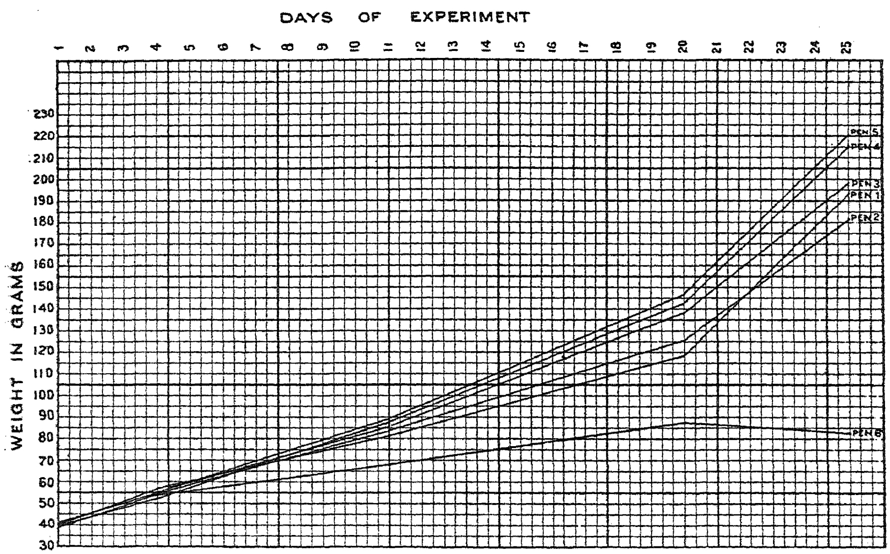


Fig. 1.—Graph showing Average Weights of Chicks throughout the Experiment.

On the eleventh and twenty-fifth days of the experiment the average weights of chickens on the different diets were as follows:—

TABLE Showing Average Weights on the Eleventh and Twenty-fifth Days.

Pens.	Oil Supplement.	Sunshine.	Green Feed.	11th day.	25th day.
				grms.	grms.
1, 2, 3, 4 ...	Given ...	None ...	None ...	85·0	197·6
5	None ...	Allowed ...	Given ...	89·4	220·4
6	None ...	None ...	None ...	67·9	83·0*

* Only one chick alive in this pen.

(*c*) *Mortality.*—The total mortality during the experimental period of twenty-five days was as follows:—

Pen 1—1 bird out of 10.

Pen 2—0 bird out of 11.

Pen 3—0 bird out of 10.

Pen 4—1 bird out of 10.

Pen 5—1 bird out of 10.

Pen 6.—10 birds out of 10.

Conclusions.

1. In the absence of vitamins A and D from the diet fed in battery or similar brooders, growth is suspended, and chicks rapidly develop rickets and die (Pen 6).

2. Where these vitamins are supplied by giving the chicks green feed and sunshine, growth is normal, rickets does not develop, and maximum weight is obtained (Pen 5).

3. Where sunshine and green feed are not supplied, the giving of cod liver oil furnishes the birds with a sufficiency of vitamins A and D to prevent rickets and allows good growth and development (Pens 1 to 4).

4. The best growth is furnished by supplying vitamins in natural form, *i.e.,* as green feed and sunshine. Growth not quite so good, but still satisfactory, is obtained by adding 1 per cent. cod liver oil to the mash.

5. Where chickens have to be raised in the absence of sunlight, as for example in battery brooders, the administration of cod liver oil is essential.

Winter Crops for Hand-Feeding on the North Coast.

From the point of view of yield nothing seems to approach a combination crop of Clarendon wheat and Buddah oats as a winter feed for dairy stock at the Wollongbar Experiment Farm, near Lismore. For some years now trials have been carried out at this farm to determine the most suitable fodder crops for hand-feeding during the winter months. The yields in last year's trial, as supplied by Mr. G. Giles, the Experimentalist, are:—Clarendon wheat combined with Buddah oats 9 tons 12 cwt., Baroota Wonder wheat 7 tons 19 cwt., Clarendon wheat, 7 tons 18 cwt., Geeralying wheat 7 tons 4 cwt., Buddah oats combined with purple vetches 7 tons 3 cwt, Buddah oats 6 tons 13 cwt., Sunrise oats 6 tons 6 cwt., Buddah oats combined with Lima peas 5 tons 18 cwt, Mulga oats 4 tons 3 cwt.

The advantage to be gained by sowing a legume like vetches is very evident. The resultant crop is bulkier and more nutritious. The use of field peas in the combination has several objections, one being that they are less palatable than vetches, and another objection is that pea spot takes heavy toll of the crop.

Poultry Notes.

April.

E. HADLINGTON, Poultry Expert.

Prepare for the Breeding Season.

DURING the month of April the important work of selecting the breeding stock should be well in hand, so that the birds may be settled down ready for the hatching season, which should commence not later than 1st June. In fact, it is better to start a week or two earlier rather than extend to later than the end of September. This is a matter which cannot be too strongly emphasised, particularly in these times when so many people are taking up poultry-farming. Those who have not learnt by experience the results of late hatching are apt to draw conclusions, perhaps from one season's operations which may have proved satisfactory because the chickens were reared under good conditions on new ground, or, perhaps, because only one lot was run through the rearing equipment at the end of September or during October without any ill effects. These odd experiences, however, do not prove that the practice is advisable, and those who desire to work on safe lines will do well to adhere to methods which have been found by long experience to be sound. What usually happens to late-hatched chickens is that they do not grow as well in the early stages, and when the hot weather comes development is further retarded until the cooler weather of the autumn commences. Consequently, the pullets are often two to three months longer coming into production, and the cockerels do not realise nearly the same prices on the market as those hatched early in the season. Not only so, but the late chickens are more prone to diseases and worm infestation, whereas the early ones thrive better, the cockerels sell better, and the pullets are more profitable as layers, despite the fact that they mostly go through a partial moult at the end of the summer, and make good breeders which will produce more eggs early in the breeding season than hens.

Estimating Requirements.

Before commencing to select the breeding stock, the number of chickens it is desired to hatch should be decided upon. Then an estimate can be made of the number of breeders required, by allowing at least fifty birds for each 1,000 chickens, that is, where hatching operations are to be carried on continuously from 1st June to the end of September. Of course, in cases where large numbers of chickens are required to fill the brooders at once, a greater number of breeding stock will be necessary. Where possible, however, it is better to fill the brooders gradually, so as to have a continuous supply of chickens through the season, rather than have long periods between the different batches. Moreover, when all the brooders are filled at the one time with chickens of the same age, more equipment is required

through the rearing stage than if smaller lots of chickens are placed in the brooders at shorter intervals.

It is a mistake to have many more breeders than are required, for it should be the aim to select only the very best specimens. Unfortunately, too little attention is paid to this aspect of the matter, and on many farms there are to be seen in the breeding pens birds which, to say the least, are unsuitable, and not the class to maintain quality or egg production, and which are selected simply because they are laying when the eggs are required. There may be some excuse for making up a few extra pens early in the season when eggs are scarce, but only the cream of the stock should be used for breeding purposes as egg production increases.

With the rapid growth of the poultry industry in this country, it has become more than ever necessary that the greatest care be exercised in the selection of breeding stock if we are to avoid the weaknesses which are apparent in countries where poultry farming is carried on more extensively.

Single Breeding Pens.

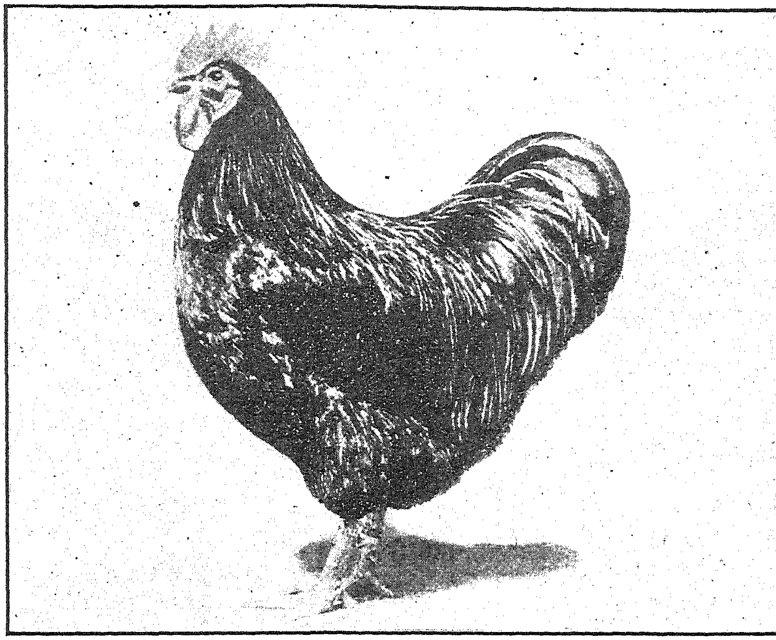
An endeavour should be made on all farms to mate up at least a few single breeding pens, but the more the better. These should be the best birds available, and as far as possible the progeny of these birds should be used for breeding from subsequently. It is only by this means that uniformity of type and egg production can be expected, as it should be obvious that where large flock matings are used there cannot be the same uniformity as in a single pen of one male with eight to ten females.

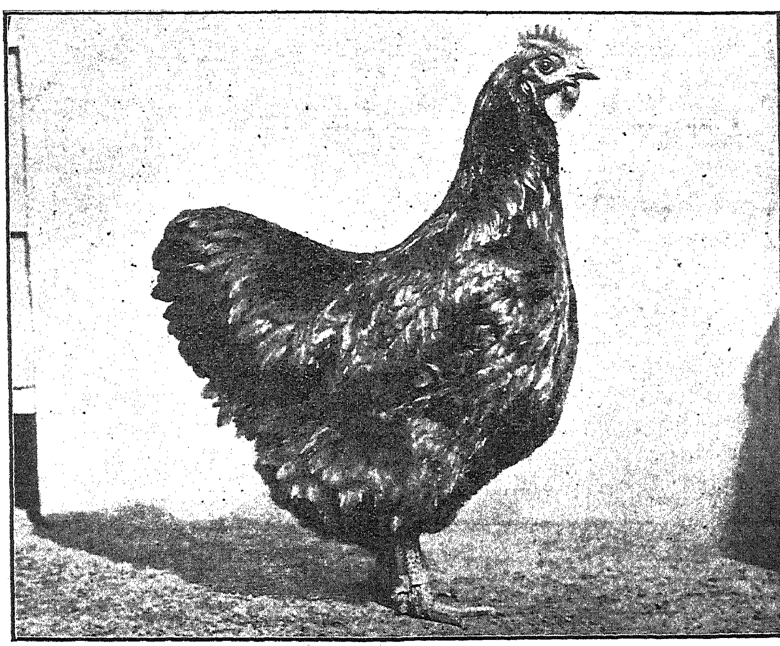
Essential Factors.

The first considerations in selecting breeding stock should be robustness of physique and uniformity of type, because without these essentials a sound flock cannot be maintained. Laying qualities must, of course, be combined, but in this connection pedigree alone should not be relied upon, nor should the farmer be carried away by fineness of texture in comb, face, etc., when not accompanied by the other factors mentioned previously. In recent years there has been a growing tendency towards the selection of breeding birds mainly because they are what is termed "very fine in texture," regardless of the fact that they do not conform to a desirable standard of physique, and the result is seen in the increasing numbers of small birds and small eggs.

In the matter of physique, there is no reason why any poultry farmer need be in doubt as to the class of birds suitable, because weight is a fairly reliable guide, and the minimum weights for utility birds have on several occasions previously been given in these notes. For the information of those new to the industry, however, they are shown again hereunder.

Cockerels of the light breeds should weigh at least 5 lb. and pullets 4 lb.; cocks and hens 1 lb. to 1½ lb. heavier. In the case of heavy breeds, such as Australorps, Croad Langshans, Rhode Island Reds, etc., the minimum weights required are: Cockerels 7 lb., pullets 5 lb., and birds a year or more older 1 lb. to 1½ lb. heavier. It should be clearly understood that the weights stated for cockerels and pullets are the minimum, and it would be





Typical Australorps.
Showing the physique and character desirable in breeding birds.

preferable to select birds at least ½ lb. heavier. Naturally, allowance must be made for any birds selected early in the season which may not be in good condition on account of moulting, etc., but no birds less than ten months old should be used in the breeding pens, and at that age there should be no difficulty in securing the weights stipulated.

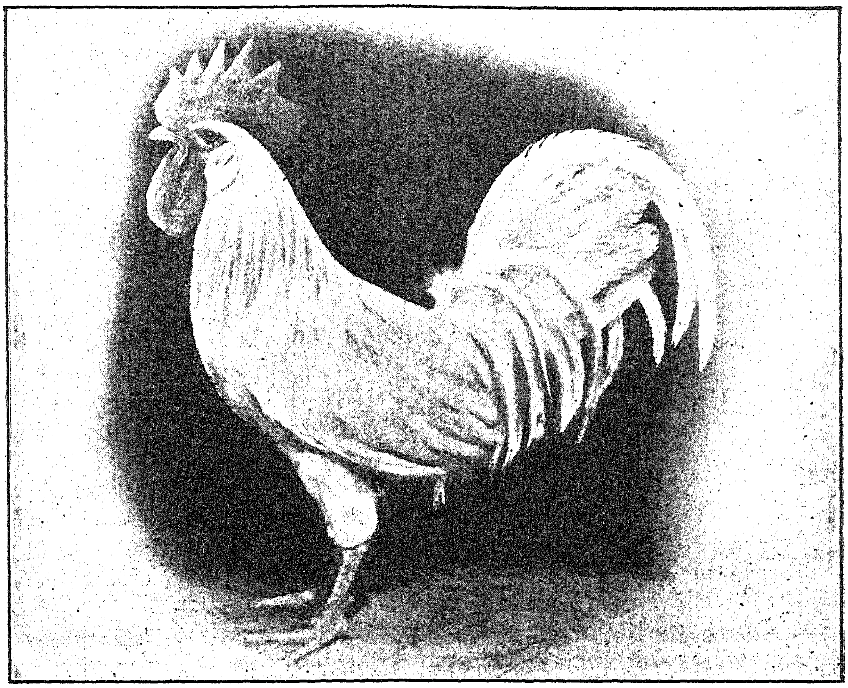
Introduction of New Blood.

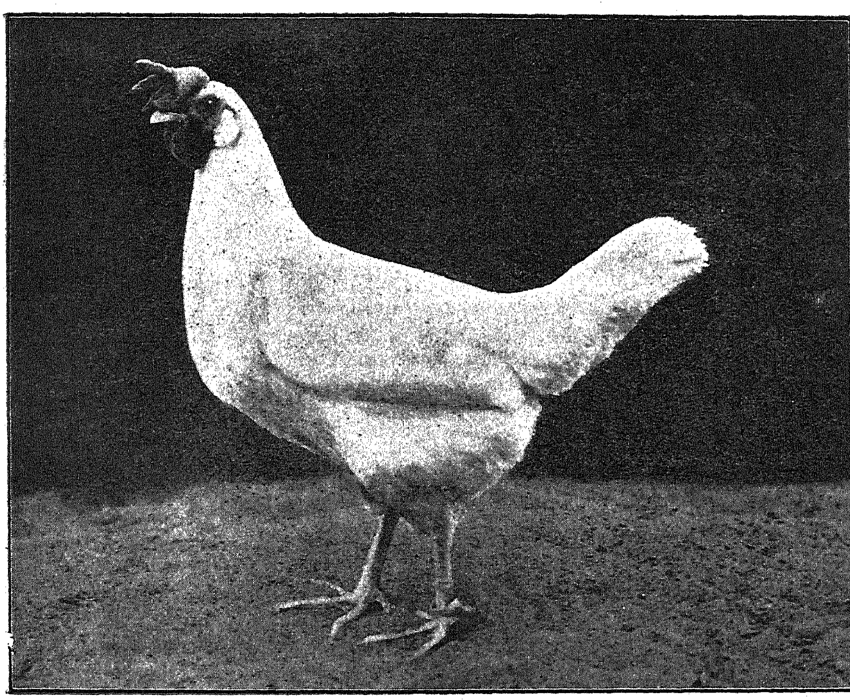
Judging by the number of inquiries received as to the desirability of introducing new blood into the flocks, and the fear expressed by many as to whether disastrous results may follow upon bringing in new birds, there appears to be some necessity for a definite reassurance on the question. In this connection I would say, without hesitation, that the industry would benefit greatly if a general practice were made of infusing entirely new blood more frequently, rather than mating birds of doubtful relationship, which is at present a fairly common procedure. Far too much haphazard breeding is done on poultry farms to be good for the industry; it should be made a rigid rule that no birds are mated unless their relationship is known beyond doubt, yet one often comes across cases where the male birds reared from a batch of chickens purchased are used with the pullets of the same lot, the buyer not knowing how they were bred, and trusting to luck that they are not closely related. The reason why this is done, of course, is to save the expense of buying a few cockerels. There need be little wonder, then, that there are many flocks which lack resistance to disease. As a matter of fact, day-old chickens should not be looked upon as potential breeders at all, but only as laying stock and market birds. This practice of breeding from birds reared from "mass production" chickens is one of the chief causes of the high rate of mortality among flocks in parts of America, and breeders here should take heed of this warning before it is too late.

Record of Matings.

Now is the time to start on a definite system of breeding, and where it is necessary no time should be lost in purchasing new blood. In some cases it may only be necessary to introduce one or two male birds to breed cockerels for the next season, while in others it may be advisable to secure a pen or two to form the nucleus of a new flock, but in all cases a chart should be kept showing the matings and the pedigree markings of the progeny.

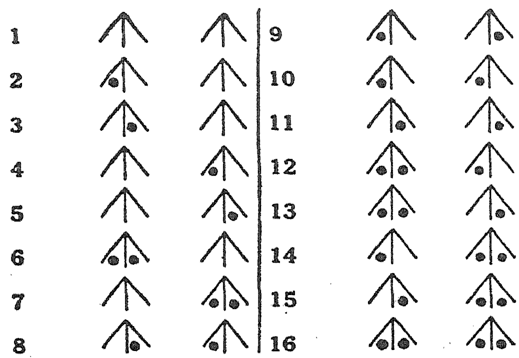
For marking the progeny, there is no better method than making holes in the webs of the feet before the chickens are placed in the brooders. The most effective way of doing this is to use a large red-hot needle, or a piece of pointed steel wire, the one end of which has been stuck into a cork or piece of wood to facilitate handling. The needle must be hot enough to sear through the web without any pressure, otherwise the hole will heal up.





Utility White Leghorns.
The types of bird suitable for the breeding pen.

It is a good plan, where large numbers of chickens are to be marked, to have a primus stove, and use two needles, placing one in the flame while the other is being used. The needle can then be changed for each chicken. In some cases a little movement of the hand may result in the hole being broken out of the web, but if it has been made far enough into the web the



A Series of Designs for "Web Punching."

mark will be apparent when the bird grows up. As will be seen from the accompanying chart, sixteen distinct markings can be made by varying the number and position of the holes in the webs.

A record should be kept of the marking of each strain of bird, showing particulars of the mating from which they were bred, so that too close relationships can be avoided in subsequent breeding.

Symptoms of Newcastle Disease (Pseudo Fowl Plague).

Affected birds tend to get into corners away from other birds. The legs are unable to support the weight of the body. Birds, therefore, lie with the legs flexed and the wings slightly extended. This is very typical of affected birds. The tail feathers droop and the comb is limp and drooping. The comb may be cyanotic, but this feature is usually not marked until immediately before death. Gaping occurs and a soft clucking noise accompanies each respiratory act. Occasionally, affected birds give rise to a peculiar screech which defies description. A greenish diarrhoea is well marked and is said to be typical.

It is Compulsory to Insure Farm Hands.

The attention of farmers is drawn to the fact that it is compulsory to insure under the Workers' Compensation Act, 1926-29, all hands employed on the farm. The Act provides a substantial penalty for those who fail to insure.

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Keeping Riverina Farmers Abreast of the Times.

FARMER-CONDUCTED WHEAT AND OAT TRIALS POINT THE WAY.

G. C. BARTLETT, H.D.A., Senior Agricultural Instructor.

A Favourable Season.

THE wettest autumn and early winter on record delayed the 1931 winter ploughing about two months throughout the district. The spring came in quickly and remained dry and hot, and those fallows that had not been worked up early and quickly became dry and hard. Fortunately good seasonal breaks came early in 1932, and the season continued very favourable right up till harvesting. Good seeding and excellent harvesting conditions were experienced except for one heavy fall of rain in April, which had a retarding effect on the early sown wheats owing to the setting of the soil and a heavy storm in late spring. Most of the crops were very tall and heavy, and a great deal of lodging took place, especially in the oat crops. The season was slightly on the wet side for best results in the eastern portion of the district. Generally from early February onwards the rain came in beneficial quantities and fell at desirable periods.

The following table gives the rainfall in the various districts during the fallow and growing periods.

RAINFALL Table, 1931-32.

	Albury (Gerogery).	Jindera.	Corowa (Ringwood).	Holbrook.	Wagga (Uranquinty)	Henty (Munyabla).	Culcairn (Walkyrie).	Walbundrie.	Lockhart (Urangeline).	Berrigan.	Finley.	Mathoura.	Tumbarumba.
1931.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.
July	238	232	207	265	152	119	170	135	134	104	116	108	300
August... ...	358	235	183	227	107	164	170	156	100	91	80	31	396
September ...	171	180	116	178	203	179	197	159	214	106	144	132	234
October ...	179	156	161	138	41	107	120	117	94	142	149	151	177
November ...	376	305	217	230	118	275	321	251	280	163	112	31	392
December ...	43	60	4	38	19	71	21	25	6	7	...	45	115
1932.													
January ...	4	23	...	23	3	20	10	13	18	10	10	4	36
February ...	195	194	82	165	147	183	247	158	207	36	130	173	142
March	233	402	274	461	372	490	521	256	286	166	144	191	884
Total on Fallow	1,797	1,787	1,244	1,725	1,162	1,608	1,777	1,270	1,339	825	885	866	2,676
1932.													
April	478	450	459	408	282	307	374	347	256	294	185	316	551
May	61	48	32	40	69	44	42	34	30	38	54	47	33
June	439	391	246	419	209	359	324	310	264	168	162	247	679
July	210	238	185	243	139	213	161	161	128	198	164	215	227
August... ...	356	374	273	460	362	364	370	331	306	289	225	244	617
September ...	133	124	157	129	105	128	121	113	115	218	220	103	154
October ...	200	214	152	119	92	104	133	109	132	102	82	103	306
November ...	95	79	73	122	145	82	48	73	95	164	219	34	124
Total on Crop	1,972	1,918	1,577	1,940	1,403	1,601	1,573	1,478	1,326	1,471	1,311	1,309	2,691

The Best Wheats for the Riverina.

Yandilla King, Marshall's No. 3, and Turvey are still the most successful late wheats for the Riverina. Late varieties yielded lighter than usual last season in the eastern Riverina, due to the wet conditions. Furthermore, Marshall's No. 3 outyielded Yandilla King last season on some of the stronger soils. This is unusual.

Baringa is a promising variety of the mid-season to late class, but in the opinion of some growers it is considered to be tough to strip. Careful observations, however, showed it to be about on a par with Yandilla King in this respect.

CULTURAL Details and Yields of Wheat Variety Trials.

Riverina.

District	Gerogery.	Jindera.	Balldale.	Corowa (Ringwood).	Holbrook.	Uranquinty.	Henty.
Experimenter... ...	C. W. Moll.	G. Nation.	G. Howard.	F. Knight.	G. Perry.	T. Rodham.	R. Nottle.
Nature of soil... ...	Red loam...	Brown loam	Red loam...	Brown loam	Grey loam..	Red loam...	Brown loam.
Ploughing	Mouldboard. 4½ inches, July.	Mouldboard 4 inches, October.	Mouldboard. 4 inches, August.	Mouldboard. 4½ inches, August.	Mouldboard, 4 inches, September.	Mouldboard, 4½ inches, September.	Mouldboard, 4 inches, September.
ultivation	Harrowed September, scarified October and again February.	Harrowed November, spring-toothed February, harrowed March and April.	Spring-toothed October and again March.	Harrowed September, smooged November, disced April, spring-toothed April.	Harrowed and disced November, spring-toothed February and April.	Harrowed and spring-toothed October, spring-toothed February and May.	Harrowed February scarified May, and harrowed, spring-toothed April.
Date of sowing ...	23 April & 14 May.	16 and 26 April.	9 May.	10 May.	1 May.	5 May.	23 April & 14 May.
Seed per acre ...	65–75 lb.	65–70 lb.	65 lb.	65–70 lb.	65–75 lb.	60–70 lb.	70 lb.
Superphosphate per acre	90 lb.	90 lb.	80 lb.	100 lb.	50 lb.	80 lb.	75 lb.
After treatment ...	Harrowed...	...	Harrowed...	...	...	...	...
Varieties	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Aussie	...	...	...	31·8	...	...	...
Bobin	32·6	25·5	47·2	32·7	30·1	40·6	37·3
Bena	29·7	...	37·1	27·9	25·8	34·7	26·2
Baringa	28·6	...	...	25·1	...	...	...
Bredbo	...	...	...	...	20·2	...	...
Canberra	...	...	...	...	...	...	...
Duri	...	...	...	...	...	...	...
Duchess	...	...	...	...	...	37·6	21·9
Dundee	20·7	...	...	...	...	...	...
Federation	...	...	...	...	...	...	...
Ford	...	...	35·8	...	...	...	29·5
Geeralying	...	...	...	...	...	...	...
Gallipoli	...	...	...	28·2	...	40·4	25·2
Ghurka	...	...	...	...	...	...	...
Marshall's No. 3 ...	20·3	16·8	...	24·6	...	...	23·8
Mogul	...	...	...	33·3	...	...	...
Nizam	...	...	...	...	...	...	...
Nabawa	20·7	...	49·6	...	...	...	...
Penny	...	...	41·5	...	24·7	...	...
Rajah	...	...	...	...	...	...	...
Ranee	...	29·8	...	...	...	...	...
Turvey	...	...	32·7	...	...	36·0	...
Union	...	...	...	...	...	...	...
Wandilla	...	...	...	...	25·7	...	...
Waratah	27·1	23·2	49·5	28·5	31·8	33·1	26·2
Yandilla King ...	18·2	19·6	27·6	25·6	14·3	36·3	24·1

CULTURAL Details and Yields of Wheat Variety Trials—*continued.*

	Riverina—*continued*.			South-western Riverina.			
District	Munyabla.	Walkyrie.	Walbundrie.	Urangeline.	Berrigan.	Finley.	Mathoura.
Experimenter... ...	C. Campbell.	H. McCrum.	E. J. Barker.	D. J. McLellan.	W. Thornton.	W. Waite.	W. Glenn.
Nature of soil... ...	Brown loam	Brown loam	Grey clay loam.	Red loam ..	Red plain...	Red plain ..	Red plain
Ploughing	Mouldboard, 4 inches, August.	Mouldboard, 4 inches, August.	Disced, 3 inches, March; mouldboard, 4 inches, August.	Mouldboard, 4 inches, July.	Mouldboard, 4 inches, September.	Disc-ploughed, 5 inches, August.	Mouldboard, 4 inches, August.
Cultivation	Harrowed September spring-toothed February, scarified April.	Harrowed and spring-toothed October, harrowed March, spring-toothed May.	Harrowed and smooged September, harrowed October, scarified November, harrowed January, scarified February, harrowed April.	Spring-toothed October, scarified February, and again April.	Harrowed October, spring-toothed April and rolled, spring-toothed and harrowed May.	Harrowed September, disced and harrowed October, spring-toothed and harrowed March, harrowed April.	Harrowed September spring-toothed September and March scarified May.
Date of sowing ...	24 April and 1 May	12 May.	1 and 15 May.	15 and 22 April, and 10 May.	15 May.	6 May.	10 May.
Seed per acre ...	70 lb.	80 lb.	60–75 lb.	65–75 lb.	65 lb.	70 lb.	75 lb.
Superphosphate per acre	112 lb.	60 lb.	84 lb.	100 lb.	80 lb.	100 lb.	75 lb.
After treatment ...	Fed off late	...	...	...	...	Harrowed August.	
Remarks	......	...	...	...	...	...	Blue mould and mice affected germination.
Varieties.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Aussie	22·1	32·2	...	33·2	...	...	...
Bobin	32·4	33·0	34·7	41·8	43·1	37·0	21·4
Bena	...	...	28·3	...	38·3	...	...
Baringa	30·0	27·7	...	...	38·4	...	18·8
Canberra	...	...	...	...	...	...	11·8
Duri	...	28·5	...	...	...	...	...
Duchess	...	...	27·8	...	...	...	...
Dundee	25·1	...	...	41·5	...	...	...
Federation	...	...	...	...	36·1	27·0	14·6
Ford	...	22·8	...	...	...	...	...
Geeralying	...	33·4	...	...	...	...	...
Gallipoli	...	...	...	...	38·5	30·0	...
Ghurka	...	...	...	...	...	...	19·8
Marshall's No. 3 ...	18·4	...	...	26·2	...	...	...
Nizam	...	...	...	...	37·0	...	...
Nabawa	23·5	21·4	30·2	29·2	35·8	27·6	...
Penny	...	23·0	...	...	...	...	...
Rajah	...	...	...	...	...	...	19·2
Rance	...	...	...	31·8	32·6	29·6	22·5
Turvey	...	...	25·4	...	...	...	...
Union	...	...	...	...	...	28·8	13·3
Waratah	22·5	29·7	27·6	39·1	37·1	28·2	23·8
Yandilla King ...	17·5	18·7	28·1	21·4	...	...	...

Nabawa shows to best advantage in a dry season. Bena and Gallipoli still remain good mid-season varieties, while Ford, Dundee, and Mogul are other mid-season wheats of promise.

A notable feature of these trials is the success of the early varieties, thus dispelling the opinion held by some that these wheats are poor yielders. The repeated success of Bobin is outstanding.

The yields were light at Holbrook, Munyabla, and Mathoura. At Holbrook the soil was a grey heavy clay loam, which remained cold and wet. It is to be noted also that only 50 lb. superphosphate was used. At Munyabla a good strike was obtained, but the plots were fed off late and under wet conditions in July. They did not recover to normal under this severe check, and also it was noticed that the tramping of the soil by the sheep further retarded growth. At Mathoura the plots were sown late and were further damaged by mould and mice.

Superphosphate Gives Big Increases.

Wheat fertiliser trials were carried out at several centres. Superphosphate increased the yield by up to 60 per cent. on fallow and 43 per cent. on stubble land. That superphosphate alone gives the most profitable increases was demonstrated not only in last season's trials, but in those of previous years. Fertiliser mixtures containing varying amounts of nitrogen in the form of sulphate of ammonia, while not giving as big increases as superphosphate alone, have the added disadvantage of being dearer.

YIELDS in the Riverina Wheat Fertiliser Trials.

District	Berrigan.	Finley.	Urangeline.	Walbundrie.	Munyabla.	Henty.
Experimenter	W. Thornton.	W. Waite.	D. J. McLellan.	E. J. Barker.	C. Campbell.	R. Nottle.
Variety	Gallipoli ...	Federation ..	Waratah ...	Yandilla King.	Nabawa ...	Waratah.
Fertiliser—	bus.	bus.	bus.	bus.	bus.	bus.
No manure	30·2	18	......	13·8	......	16
56 lb. superphosphate ..	36·4	......	33·1	22·4	17·4	......
84 lb. superphosphate ..	38·5	27	39·1	21·6	22·8	23·4
112 lb. superphosphate ..	......	......	......	22·3	23·5	......
132 lb. superphosphate ..	......	......	......	23·6	......	......
98 lb. P11 mixture ...	......	27·5	......	......	......	22·1
112 lb. P15 mixture ...	......	21	......	......	......	22·5
126 lb. M17 mixture ...	......	26	......	......	......	23·1

NOTE.—All trials were on fallow, except Henty, which was on stubble land. A further trial at Gerogery was destroyed by a storm. P11 mixture contains six parts superphosphate and one part sulphate of ammonia; P15 three parts superphosphate and one part sulphate of ammonia; M17 two parts superphosphate and one part sulphate of ammonia.

In a rate of seeding trial carried out by Mr. W. Thornton at Berrigan, using Gallipoli wheat, 88 lb. seed per acre gave a yield of 40.6 bushels per acre as compared with 38 bushels from a 66 lb. seeding.

That it pays to keep up the standard of seed used by obtaining at least some pedigree seed of the varieties used from the experiment farms each year was demonstrated by the results of a trial carried out at Walbundrie, where the farmer's own seed and pedigree seed obtained from the experiment farm were sown and the yields compared. Yandilla King was the

variety used, the plots being sown on good fallow on 30th April, using 60 lb. seed and 84 lb. superphosphate per acre. The pedigree seed yielded 28.1 bushels per acre, and the other seed 21.6 bushels.

A depth-of-ploughing trial at Balldale showed up in favour of mouldboard ploughing 4 inches deep as against 3 inches deep, the former giving a yield of 15 bushels and the latter 12 bushels per acre.

Are you Growing the Best Oat Varieties?

Algerian is still the most successful late oat, but Belar rivals it closely and is rapidly gaining in favour, as it is sweeter and comes in a little earlier.

Mulga is still the best early oat. It is sweet and palatable and grows well in the early stages.

Palestine does very well in the western part of the Riverina, but it was tried in the eastern section in previous years without success.

Superphosphate Also Good for Oats.

Superphosphate again showed to advantage in the oat fertiliser trials, while mixtures containing nitrogen gave about the same results as with wheat. In this trial the plots on stubble yielded equally as well as those on fallow. Perhaps the explanation of this is that last season was a most favourable one for oat growing.

YIELDS in the Oat Fertiliser Trials.

Fertiliser per acre.	Balldale (J. M. Wilson).	Henty (C. Hohnberg).	Walbundrie (F. J. Barker).	Urangeline (D. J. McLellan).
	bus.	bus.	bus.	bus.
No manure	......	......	38·1	32·7
56 lb. superphosphate ...	......	......	33·1	60·1
66 lb. P11 mixture ...	......	......	36·1	52·7
76 lb. P15 mixture ...	......	......	34·4	56·2
90 lb. M17 mixture ...	......	......	......	58·1
70 lb. superphosphate ...	36	......	......	......
84 lb. superphosphate ...	......	58·5	41·2	65·4
90 lb. superphosphate ...	38	......	......	......
98 lb. P11 mixture ...	......	48·6	......	56·3
112 lb. P15 mixture ...	......	37·8	......	60·9

NOTE.—Algerian was the variety used, except at Urangeline, where Mulga was used.

At Walbundrie the no-manure plot showed up well, but this was due to a storm damaging the other plots, which were more forward at the time. The unfertilised plot, being later and greener, suffered the least.

Sheep Preferred Mulga and Belar.

Mr. C. Hohnberg conducted a grazing trial with oats at Henty, using Algerian, Belar, Gidgee and Mulga. The sheep definitely preferred Mulga and Belar, and the recovery of these after grazing was excellent, as shown by the yields in the variety trial at Henty. The plots were grazed in July.

Cultural Details and Yields of Oat Variety Trials.

District ...	Jindera.	Balldale.	Corowa.	Holbrook.	Uranquinty.
Experimenter ...	G. Nation.	J. M. Wilson.	F. Knight.	G. Perry.	T. Rodham.
Nature of soil ...	Brown loam ..	Red loam ...	Brown loam ..	Grey clay loam.	Red loam.
Ploughing ...	Mouldboard, 4 inches, October.	...	Mouldboard, 4½ inches, August.	Mouldboard, 4 inches, September.	Mouldboard, 4 inches, September.
Cultivation ...	Harrowed November, springtoothed and harrowed February and March, harrowed April.	Wheat 1931; stubble burnt and disced March.	Harrowed September, smooged November, disced and springtoothed April.	Harrowed and disced November, springtoothed February and April.	Harrowed and springtoothed October, spring-toothed February and May.
Date of sowing ...	26 April.	15 May.	10 May.	1 May.	4 May.
Seed per acre ...	60 lb.	60 lb.	60 lb.	70 lb.	60 lb.
Superphosphate per acre ...	60 lb.	70 lb.	60 lb.	50 lb.	80 lb.
After treatment ...	...	Harrowed ...	...	...	...
Remarks ...	Mulga damaged by storm.	...	Lay land, out 3 years.	...	Mulga damaged by storm.
Varieties.	bus.	bus.	bus.	bus.	bus.
Algerian ...	35·1	36	...	16·6	46·3
Belar ...	33·6	29	34·4	12·1	44·1
Guyra ...	...	31	...	...	50·1
Gidgee ...	...	22	36·1	26·1	...
Mulga ...	21·6	28	...	14·3	...

Cultural Details and Yields of Oat Variety Trials—*continued.*

District ...	Henty.	Walbundrie.	Urangeline.	Berrigan.	Finley.
Experimenter ...	C. Hohnberg.	E. J. Barker.	D. J. McLellan.	W. Thornton.	W. Waite.
Nature of soil ...	Brown loam ...	Grey clay loam	Red clay loam	Red plain ...	Red plain.
Ploughing ...	...	...	...	Reploughed, 4 inches, September.	Disc-ploughed, 5 inches, August.
Cultivation ...	Wheat, 1931; stubble burnt and disced March, harrowed April.	Wheat, 1931; stubble burnt, disced and harrowed April.	Wheat, 1931; stubble burnt, disced and springtoothed March.	Harrowed and springtoothed April, rolled, springtoothed and harrowed May.	Harrowed September, disced and harrowed October, harrowed and springtoothed March, harrowed April.
Date of sowing ...	20 April.	27 April.	15 April.	13 May.	6 May.
Seed per acre ...	60 lb.	*	50 lb.	60 lb.	45 lb.
Superphosphate per acre ...	75 lb.	56 lb.	60 lb.	60 lb.	60 lb.
After treatment ...	Fed-off July-August.	Harrowed ...	...	...	Harrowed August.
Remarks ...	...	...	Gidgee storm-damaged and shed.	2 years fallow; not sown 1931	Gidgee rusted; all lodged but Palestine.
Varieties.	bus.	bus.	bus.	bus.	bus.
Algerian ...	45·6	28·7	...	...	...
Belar ...	46·1	29·4	...	39·1	43
Buddah ...	...	...	...	...	34
Guyra ...	...	...	...	55·7	...
Gidgee ...	27·5	34·0	36·3	...	42
Kendall ...	...	...	...	...	36
Mulga ...	33·7	41·7	60·1	...	58
Palestine ...	...	...	...	...	75

* Algerian, 53 lb.; Belar, 64 lb.; others, 70 lb.

Wheat Growing at Berridale is a Sound Proposition.

JOHN L. GREEN, H.D.A., Agricultural Instructor.

Although it is claimed that some good crops of wheat were grown many years back in the Berridale district, it was not until last season that any one farmer had the courage to put in a large area. The pioneer in this regard is Mr. A. Binnie, "Coolamatong," Berridale, who also co-operated with the Department in carrying out trials to determine the best wheat varieties for the district and the most payable amount of superphosphate to use.

The results of these trials, coupled with Mr. Binnie's previous success, prove that wheat growing is a sound proposition in this district. Bigger yields will result from the adoption of better methods and the use of more modern machinery.

RED loam virgin country that had not been fallowed was used for the trial. The area was mouldboard cross-ploughed with a tractor to a depth of 4 inches on 28th March, and harrowed immediately prior to sowing on 18th April, the seed being broadcast on the surface with a cultivator drill. No superphosphate was used on the variety trial, and owing to windy weather the broadcasting of the superphosphate on the fertiliser trial was delayed until 29th April. This belated application, combined with the fact that the superphosphate was broadcast on the surface instead of being sown with the seed, undoubtedly operated against the best results being obtained.

The Season was Satisfactory.

Seasonal conditions, generally speaking, were satisfactory. The rainfall following sowing was rather light, but from July onwards it was well up to the average. The winter was rather severe, falls of snow being recorded in July and August, but these are to be expected every year. When fallowing is practised, the season in this district should cause the wheat-grower little worry, for although good rains cannot always be counted on in the spring, the evaporation is light compared to other districts with better rainfall. From April to December, 1932, a total of 1,449 points fell, being distributed as follows:—April 162 points, May 136, June 30, July 225, August 222, September 164, October 224, November 231, December 55 points.

The plots were harvested on 30th January. The fact that a harvester was used, coupled with intermittent rain during harvesting, reduced the yields by from 5 to 10 per cent.

The yields in the variety trials were as follows:—Marshall's No. 3, 34 bus. 10 lb.; Bobin, 33 bus.; Penny, 32 bus. 10 lb.; Yandilla King, 31 bus. 45 lb.; Cleveland, 30 bus. 10 lb; Cadia, 28 bus. 10 lb. Nabawa was also included, and yielded 35 bus. per acre, but owing to an error in the seeding rate the yield is not comparable.

Yandilla King was the variety used in the manurial trial, which resulted in superphosphate at the rate of 1½ cwt. per acre giving the best yield (34 bus. 45 lb. per acre); superphosphate 1 cwt. per acre, 32 bus. 35 lb.; and superphosphate ½ cwt. per acre, 31 bus. 45 lb.; as compared with the no-manure plot, 31 bus. 45 lb.

The Earlier Varieties did Best.

From last season's results it would appear wise to sow earlier varieties than the very late maturing Cleveland and Cadia. The latter was the only variety to exhibit weakness of straw—a very undesirable character. Marshall's No. 3, Yandilla King and Penny are of the same season, while Bobin is much earlier. Bobin has also yielded very well at Canberra, but a drawback to recommending it for Monaro is its high susceptibility to rust, which results in pinched grain. Penny will yield better than Yandilla King on light soils, but is also rust-liable. Marshall's No. 3 is also considered a better yielder than Yandilla King on the lighter soils, and is also a little more rust resistant. Marshall's No. 3 is therefore to be preferred to Yandilla King, although the latter is a very satisfactory variety to grow on Monaro, and there is no reason to change over to another variety if good results are being obtained with it on the heavier soils.

Loans for Rabbit Extermination Increased to £500.

Applicants for loans under the Unemployment Relief Scheme for the erection of rabbit-proof fencing, extermination of rabbits, etc., might now be granted up to £500, four-fifths of the loan being available for wire-netting of holdings.

Previously loans under this scheme were limited to £300, and where a settler has already obtained a loan he can apply for an increase up to £500, but any amount above £300 must be used for the erection of rabbit-proof fencing and extermination of rabbits.

Applications should be lodged with the Pastures Protection Boards or district surveyors, from whom the necessary forms are obtainable.

State Ministers for Agriculture to Confer in Sydney.

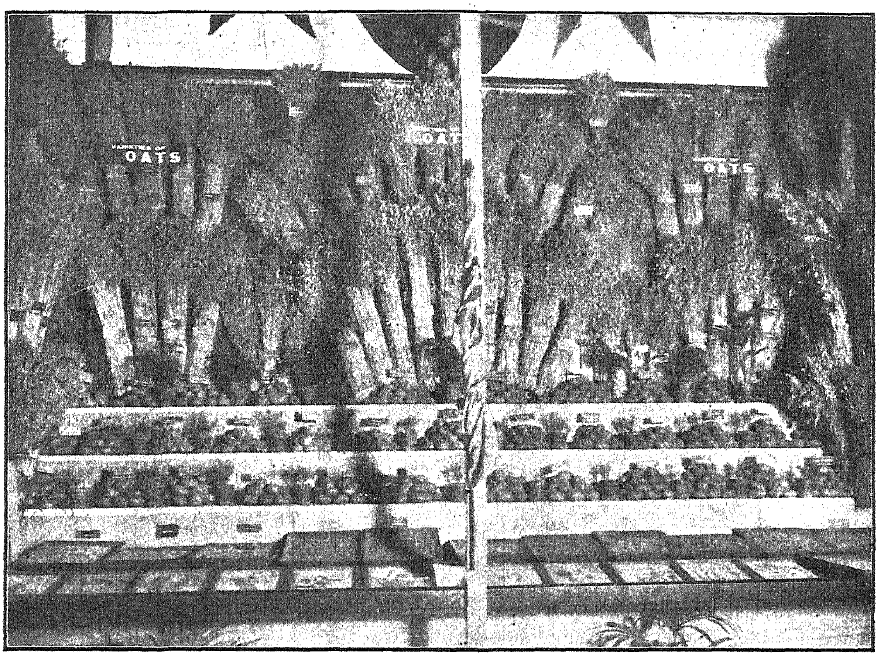
After a lapse of some years, the annual Interstate Conference of Ministers for Agriculture will be revived this year, when the deliberations will take place in Sydney from 15th to 19th of this month (May).

Many questions of importance to primary producers throughout Australia are set down for discussion. It is also the aim of the conference to bring about, as far as practicable, uniformity throughout the States in such matters as grading regulations, herd recording rules, agriculture legislation, and many other items.

The Department at the Royal Show.

Agricultural Education by the Direct Method.

During the past year many things have conspired to make the lot of the farmer most difficult, but apparently such adversities as low prices and the vagaries of the season have failed to weaken his courage to go on producing. At least, those are the impressions gained on viewing the magnificent and varied collection of products of the soil displayed in the Agricultural Hall at the Royal Agricultural Society's Sydney Show just ended. For quality, variety and attractiveness it would be hard to imagine any country in the world being able to surpass this display of rural wealth.



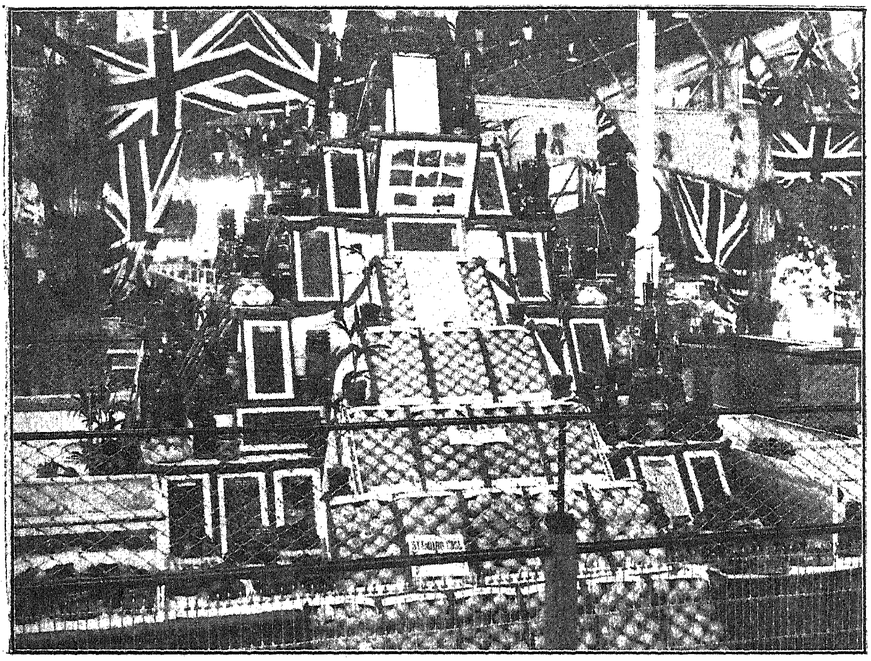
Portion of the Field Branch Section of the Department's Exhibit.

Not only does the Agricultural Hall house the magnificent district exhibits—the "show windows" for the agricultural products of this country—the apple and pear pyramids and displays of the produce of many other individual rural industries, but a large section of it is occupied by the Department's exhibit, an exhibit of an educational nature, designed to demonstrate in a practical way the recommendations of the Department.

Of Interest to the Crop Farmer.

In the cereal sections were to be seen sheaves and grain samples of varieties of wheat, oats, barley, rice, etc., that have proved best for the different districts of the State. In addition, varieties that are showing more than ordinary promise in the experiment plots were also exhibited. Likewise, there was a very instructive and attractive section devoted to maize and broom millet. With facts and figures to support these displays they must surely have been convincing to the farmer who is unprogressive enough to keep on sowing the older and less productive varieties each year.

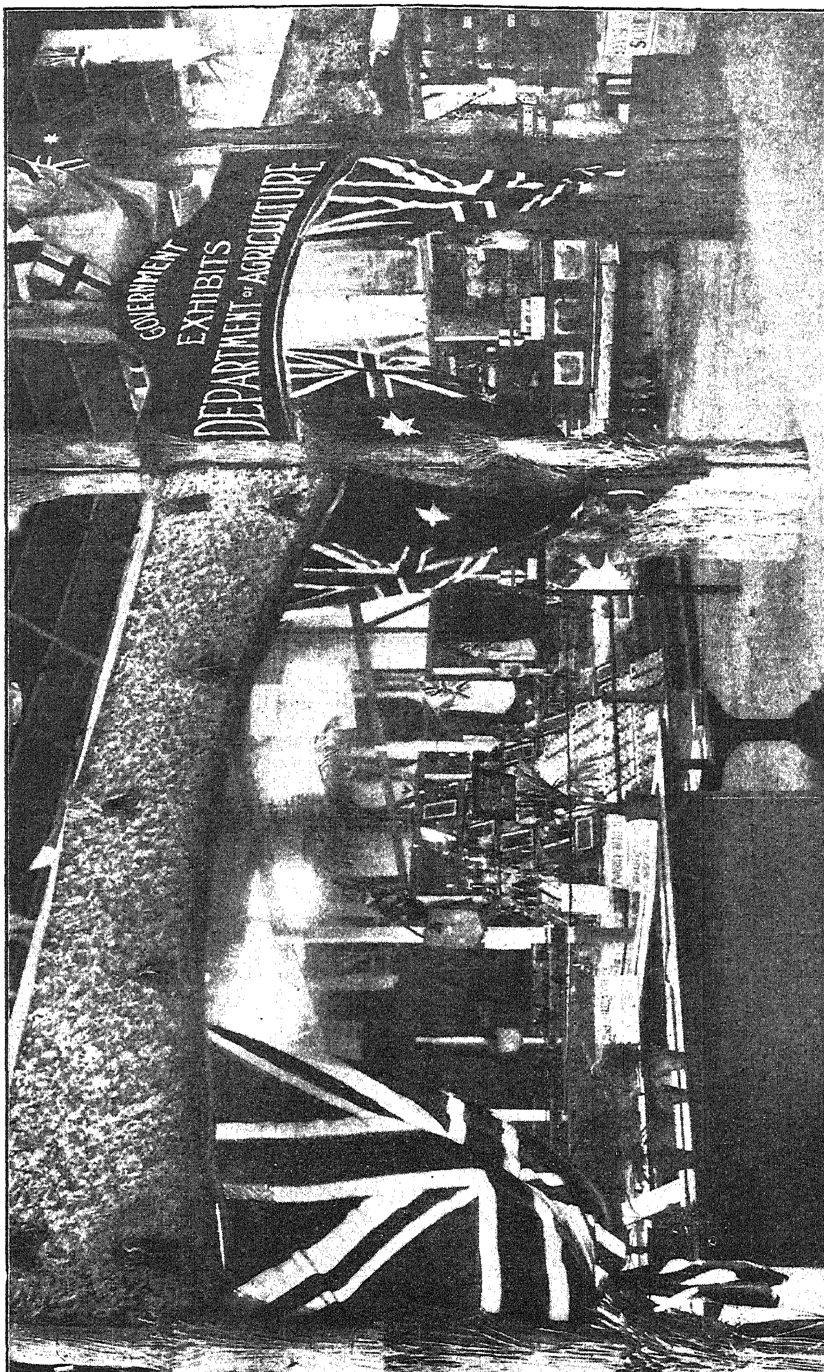
Every aspect of pasture improvement work was fully demonstrated in another section of the exhibit, where specimens of the grasses, clovers and



Fruit Branch Section of the Department's Exhibit.

fodder plants recommended for the various parts of New South Wales were displayed. Supported by photographs and printed signs explaining the exhibits and giving instructions on matters of culture, top-dressing, and other phases of pasture work, this section was sufficiently complete to satisfy even the veriest tyro. A corner of the exhibit that always attracts a good deal of attention is the collection of growing specimens of noxious weeds. It is safe to say that for the first time many farmers learn to identify some of their worst enemies by viewing these weeds, and as identification is the first step in eradication, the value of this exhibit is hard to estimate.

It takes no more work to grow a good potato, or cabbage, or any other vegetable for that matter, than it does to grow a poor one. There may be a little more work involved in harvesting the bigger crop resulting from the



A Section of the Department of Agriculture's Exhibit at the Royal Show.

better variety, but then there is the greatly enhanced returns to offset that. That there are good and poor varieties of potatoes and other vegetables was forcibly demonstrated by the vegetable exhibit staged by the Department. There, were to be seen "in the flesh" the result of the years of work in improving (by breeding, selection, and introduction) the vegetable crops of the State. The excellence of the different products were convincing and must have been an incentive to all vegetable growers. In a similar manner was demonstrated to fruitgrowers the wisdom of following the Department's recommendations in their particular sphere. The fruit exhibit occupied the central position of the Department's court and displayed a wealth of information and interest for the observant orchardist.

The Livestock Farmer's Section.

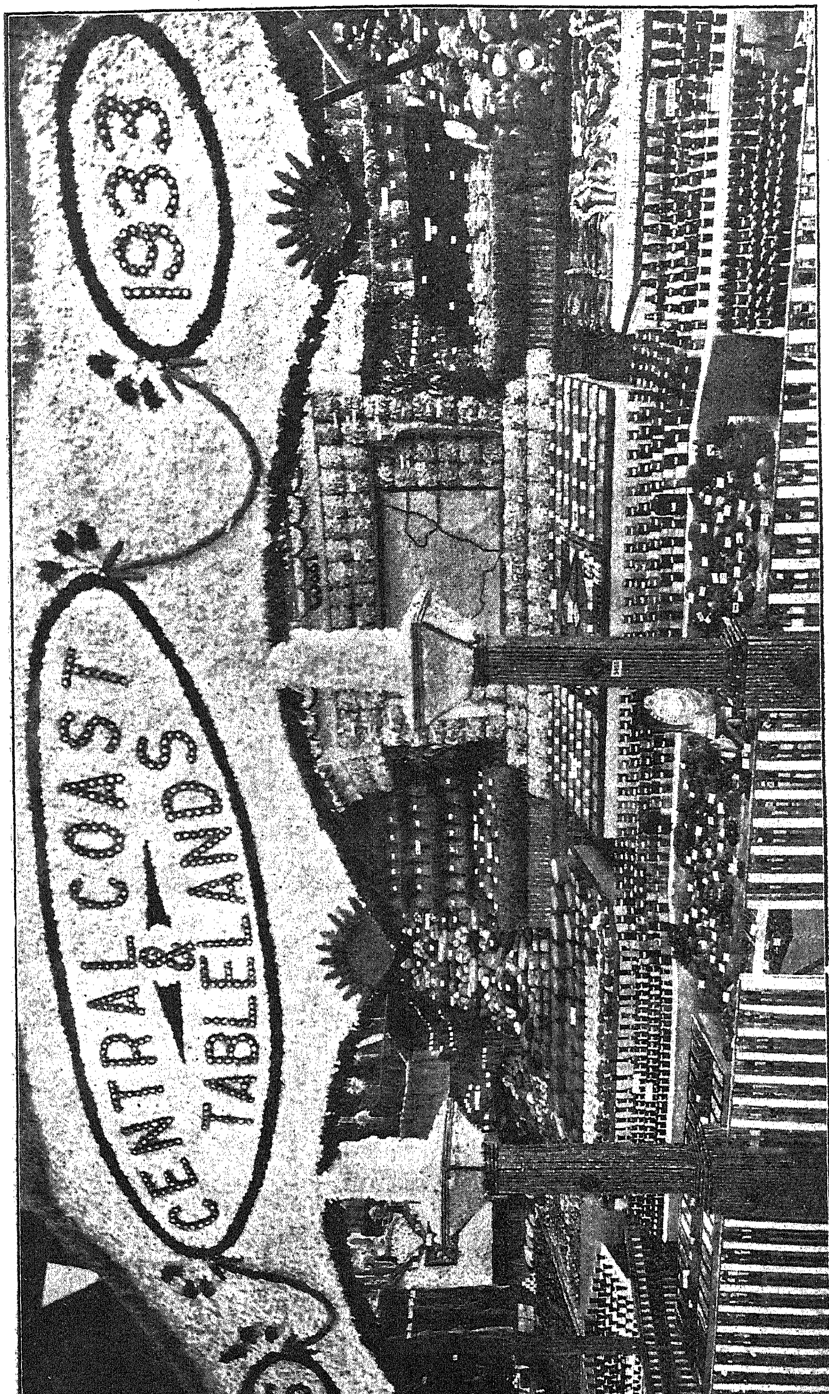
There is also much knowledge to be gained each year from the display arranged by the Department's Sheep and Wool Branch. The results of cross-breeding experiments for the production of a sheep that will provide both wool and mutton was only one item of interest. Other sections showed how different wools should be handled and classed to best advantage, how the "hairy" wool growth of the original wild sheep has been eliminated and the superfine merino wool of to-day evolved. A series of graphs indicated the importance of the wool industry, and the rise and fall of prices in recent years. The average price of wool was highest in 1925 (25½d. per lb.), while last year's average of 8½d. was the lowest since 1912. The average weight of wool per sheep shorn was 8.8 lb. in 1927 and 1929, 8.7 lb. in 1932, and it is expected to be 8.9 lb. this year, which, if correct, will constitute a record.

The Stock Branch of the Department staged exhibits showing methods and results in the treatment of diseases of stock. The profits of our livestock industries depend to a very large extent on the control of disease in the herds and flocks, and consequently the responsibility of finding improved methods of control and of enticing—in some cases compelling—farmers to apply methods already known is a heavy one. That much has been achieved in this regard was to be learned from the exhibit.

The problems of disease and pest control in the orchard and field call for no less vigilance on the part of the Entomological and Biological branches, and convincing examples of the valuable work these are doing for the primary producer were to be viewed in the section of the court occupied by exhibits staged by those branches.

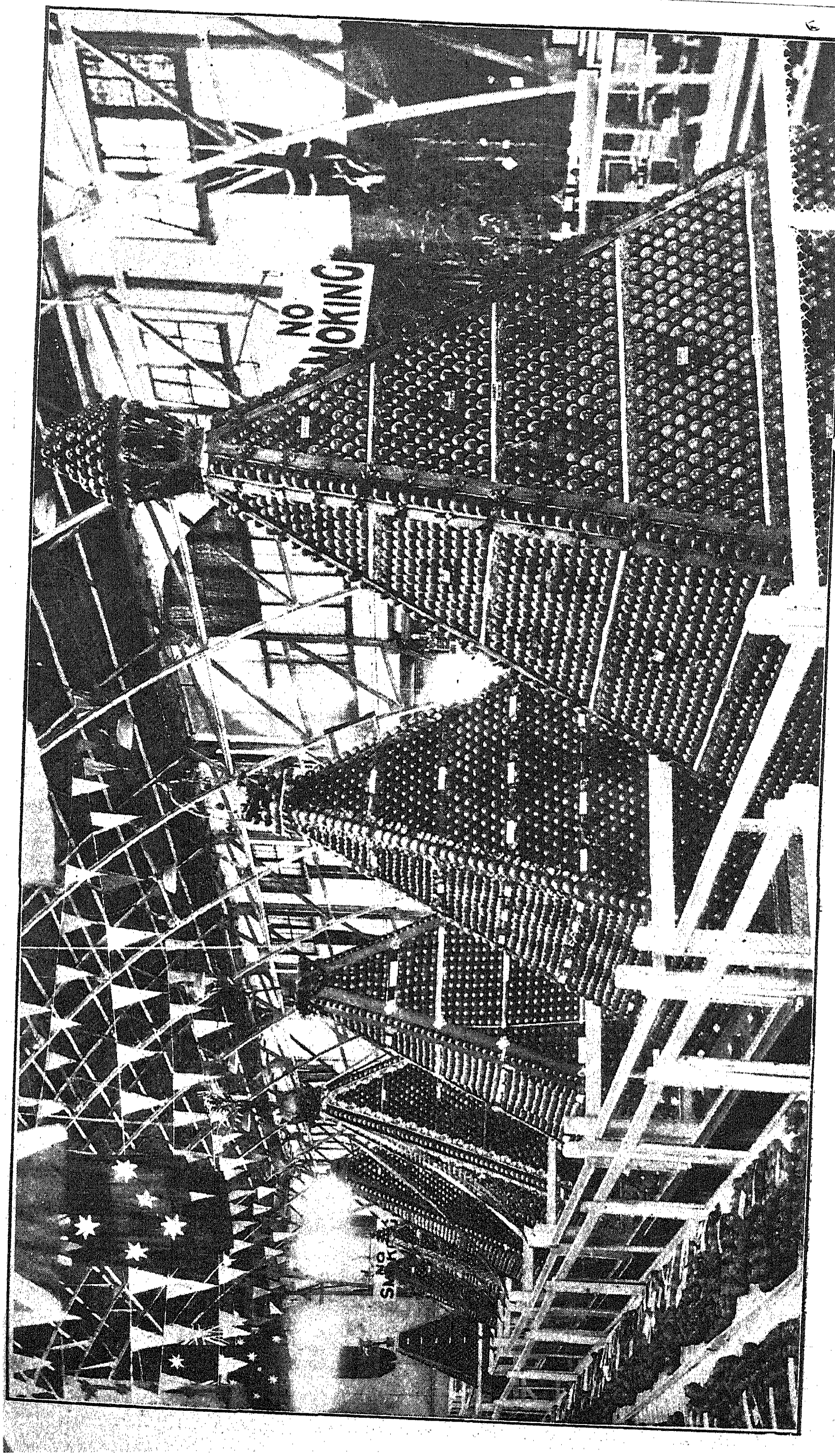
Nor was the poultry farming industry neglected in the Department's extensive display! in fact, there is no side of agrarian activity that can be benefited by the Department's experts that was not fully catered for.

The thought has often been expressed by visitors to this exhibit that it would be a great thing if such an exhibit could be preserved in some way as to be always available to farmers. While this is not possible, readers are reminded that the information conveyed by these exhibits is always available from the Department. Direct your inquiries to the Under Secretary, Box 36A, G.P.O., Sydney.



[Sydney Mail Photo.

The Winning Exhibit in the Commonwealth District Competition, 1933.



[*Sydney Mail Photo.*

Batlow Agricultural Bureau Again Won Both the Apple and Pear Exhibits.

The Federal Capital Territory Can Grow Excellent Wheat Crops.

JOHN L. GREEN, H.D.A., Agricultural Instructor.

The results of last season's experiments on the farms of Messrs. H. Hamilton, Ainslie, Canberra, and Read Bros., "The Pines," Canberra, supply further convincing evidence that excellent crops of wheat can be grown in practically all seasons in the Federal Capital Territory. Trials in this district have now been running for four seasons, making it possible to point to the varieties that show most promise and at the same time indicate those not worth persevering with. An example of the latter is Canberra, which has failed repeatedly.

The area available for growing wheat in the Federal Capital Territory is somewhat restricted, but the present area under crop could be extended considerably, and if proper cultural methods are employed profitable yields, even at present low prices, should be possible.

A Fair Season.

THE season was very satisfactory, although the rainfall was not above the average. Good rains in March and April benefited the seed bed and aided germination, while the growth throughout the winter months was well maintained. There were no heavy falls in the spring, but the incidence was satisfactory. The rainfall on the fallow totalled 971 points—made up of 101 points in October, 152 in November, 117 in December, 7 in January, 70 in February, and 524 in March. During the growing period 1,372 points fell—April recording 231, May 114, June 132, July 113, August 250, September 72, October 169, November 140, and December 151.

The trials last season were sown on medium red loam, the plot on Mr. Hamilton's farm being mouldboard ploughed 4½ inches in November, although a small portion was not ploughed till 28th March. The land was harrowed 1st April and sown with a combine on 13th April, using 60 lb. seed and 56 lb. superphosphate per acre. The crop was fed off from 1st to 7th June. The trial on Messrs. Read Bros.' farm was mouldboard ploughed 4 inches in October, cultivated on 29th March, and sown with a drill on 13th April, using 60 lb. seed and 90 lb. superphosphate per acre.

YIELDS in the Variety Trials.

Experimenter.	Bobin.	Duchess.	Duri.	Federation.	Ford.	Marshall's No. 3.	Nabawa.	Penny.	Turvey.	Union.	Waratah.	Yandilla King.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
H. Hamilton, Ainslie ...	32 9	28 57	26 12	27 6	27 44	26 51	27 20	27 11	30 9	27 44	28 4	28 42
Read Bros., "The Pines," Canberra.	43 0	40 5	33 3	30 15	40 55	39 55	38 55	38 55	40 55	43 35	38 5	42 0

Four Seasons' Results Summarised.

Eighteen varieties of wheat have been tested in the four seasons the trials have been in progress and the average yield per acre has been 29.35 bushels. All trial areas have been sown under normal farming conditions, in each instance being portion of a crop paddock.

Varieties that have proved unsuitable for the district are Gresley, Cadia, Cleveland, Currawa, Wandilla and Canberra, while Duri will be discarded unless it shows to better advantage next season.

Of the later-maturing varieties, Yandilla King must still be considered the most reliable, followed by Turvey and Penny, with Marshall's No. 3 a long way further back. The mid-season varieties under test are Federation, Union, Nabawa, Duchess and Ford, the latter two being tested for the first time last season. Union has yielded consistently and must be given preference over Federation and Nabawa. Union, however, is very disease liable, and consequently Nabawa or the newly-tried Ford, both of which are highly disease resistant, may be preferred after further experience. Ford is a South Australian variety, and can be recommended as an excellent mid-season dual-purpose (grain and hay) highly disease resistant variety, and if further trials prove it to be a good yielder in this district it should become one of the leading varieties. Duchess, another new variety, has yielded above average, but is very disease liable and weak in the straw.

Waratah, Bobin, Duri and Canberra are the early maturing varieties that have been tried, Canberra being definitely discarded as unsatisfactory. Bobin has performed excellently, and is consistent as a yielder. It is a new variety to this district, but has yielded well in other parts of the State. Any wheat-grower wishing to try a new variety could do worse than select Bobin.

Superphosphate Increases Yields.

The results of the wheat fertiliser trials last season were in keeping with previous years' results. In the eight trials conducted over four seasons superphosphate has given the following average yields:—

	bus.	lb.
Superphosphate, 1 cwt. per acre	29	30
Superphosphate, ½ cwt. ,, ...	27	24
No manure	21	8

The results, obtained on both old and new land, should be definite proof of the value of superphosphate. In a good season, when unfertilised land should yield about 21 bushels per acre, ½ cwt. per acre can reasonably be expected to give an increased yield of about 6 bushels per acre.

The yields in last year's trials were:—

	Superphosphate per acre.							
	1½ cwt.		1 cwt.		½ cwt.		No manure.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
H. Hamilton, Ainslie, Canberra	32	38	27	20	26	56	18	0
Read Bros., "The Pines," Canberra ...	40	55	38	55	36	10	27	35

Wheat Growing on the Murrumbidgee Irrigation Area.

FARMERS' EXPERIMENT PLOTS INDICATE THE BEST PRACTICES.

The Best Wheats and Oats for the Yanco-Leeton and Narrandera Districts.

A NUMBER of farmers in the Narrandera district and in the Yanco-Leeton end of the Murrumbidgee Irrigation Area, again co-operated with the Department in conducting wheat and oat experiments during the 1932 season.

The Season.

Seldom, if ever, have the fallowing and growing periods of wheat and oat crops been so nearly perfect as those experienced for the 1932 crops. In May and June, 1931, from 9 inches to 10 inches of rain fell, which thoroughly saturated the ground, while during the following four months only 2¾ to 3½ inches of rain fell at suitable intervals, thus enabling ploughing operations to be carried out satisfactorily. Owing to economic conditions and the moist state of the fallows, most of the farmers did not go to

RAINFALL Registrations.

	Coro-bimilla.	Leeton.		Coro-bimilla.	Leeton.
On the fallow—	Points.	Points.	On the crop—	Points.	Points.
1931.			1932.		
June	590	455	April	231	279
July	86	94	May	54	48
August	64	43	June	155	164
September ...	99	117	July	144	96
October	80	75	August	268	253
November ...	125	188	September ...	113	184
December ...	...	14	October	21	40
1932.			November ...	125	69
January ...	...	...			
February ...	94	84	Total on crop ...	1,111	1,133
March	215	174			
Total on fallow ...	1,353	1,244			

the expense of working them more than they considered necessary reasonably to reduce the weed growth, and several omitted to cultivate at the correct time to control Cape weed and wild oats, with the result that the yields of these plots were somewhat reduced.

* The information under this heading is from the report of Mr. H. J. Dargin Agricultural Instructor.

CULTURAL Details and Yields of Wheat Variety Trials, 1932.

	Dry Area Plots.				
District	Corobimilla.		Brobenah.		
Experimenter	Shady, J.	Sutcliffe, F. H.	Davies, T. C.	McKenzie, E.	Dodson, G.
Nature of soil	Red loam, 18 inches deep.	Red loam, 2 feet deep.	Red and grey clay loam.	Red loam, 6 inches deep.	Red loam, 8 inches deep.
Ploughing	Mouldboard, 3 inches early August.	Mouldboard, 3½ inches July.	Mouldboard, 4 inches July.	Sundercut, 3 inches July.	Mouldboard, 4 inches August.
Cultivation	Harrowed early September, Wimmera scarified September and again January, springtoothed May.	Springtoothed October, disc-cultivated March, combined early April.	Combined October, disc-cultivated March, combined April.	Springtoothed September, harrowed October, Wimmera scarified early March.	Combined and rigid-tined October, combined early April.
Date of sowing	8–9 May.	23 April.	27 April.	27 April.	14–15 April.
Seed per acre	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.
Superphosphate per acre ...	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.
Remarks	...	All yields greatly reduced by wild oats.	All yields greatly reduced by lodging, take-all, and foot-rot.	All yields greatly reduced by take-all, foot-rot, and loose smut.	...
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie	*‡§24 31	...	...	...	...
Baringa	...	¶17 47	25 30	27 56	...
Bena	...	‖12 37	19 0	‖25 7	...
Bobin	26 54	...	...	...	...
Burrill	...	16 28	22 14	28 32	...
Cleveland	...	...	...	...	*‖25 12
Currawa	...	...	...	...	28 31
Duchess	...	...	...	24 42	...
Dundee	...	19 28	27 0	32 30	...
Duri	26 20	...	...	...	...
Federation	...	‖12 43	19 50	...	...
Free Gallipoli	...	...	...	...	35 19
Ford	...	14 7	21 39	28 17	...
Geeralying	*†24 49	...	...	...	...
Marshall's No. 3	...	...	...	...	23 57
Nabawa	...	17 0	21 20	22 21	...
Penny	...	...	...	...	26 37
Rajah	28 41	...	...	...	...
Ranee	...	...	¶22 36	‖24 12	...
Riverina	*24 23	...	...	...	...
Wandilla	...	...	...	...	¶32 28
Waratah	24 44	...	...	...	...
Yandilla King	...	...	...	...	29 6

* Yields reduced by lodging. † Yields reduced by shedding. ‡ Yields reduced by take-all.
§ Yields reduced by foot-rot. ‖ Yields reduced by flag smut. ¶ Yields reduced by loose smut.

During March and April, 1932, splendid soaking rains of from 4 to 5 inches fell; consequently the whole of the plots were sown in moist seed beds and excellent germinations resulted throughout both districts. Neither of the plots grown on irrigable land required watering. Splendid seasonal rains fell during June, July, August, and September, and cool conditions throughout November and December greatly assisted in filling the heads with full plump samples of grain.

CULTURAL Details and Yields of Wheat Variety Trials, 1932—*continued.*

	Dry Area Plots.			Irrigable Plots.	
District ...	Leeton.		Sandigo.	Murrami.	Leeton.
Experimenter ...	Duruz, E., junr.	Maybon Bros.	Bull, J. L.	Lynes, C. K.	Snelson Bros.
Nature of soil ...	Light red loam, 18 inches deep.	Red loam, 6 inches deep.	Red loam, 8 inches deep.	Red loam, 18 inches deep.	Red clay loam, 6 inches deep.
Ploughing ...	Mouldboard 4 inches, August.	Mouldboard 3½ inches September.	Mouldboard, 4 inches August.	Disc, 6 inches, December.	Disc, 4 inches, October.
Cultivation ...	Sundercut February, springtoothed March, again in April.	Springtoothed end October, again November, again March, again April.	Springtoothed October, harrowed February, disc-cultivated and harrowed March, springtoothed early May.	Harrowed both ways January, springtoothed March, again April.	Sundercut December, again March, springtoothed late March, and again in April.
Date of sowing ...	15 May.	12 April.	10 May.	20-21 April.	7 May.
Seed per acre ...	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.
Superphosphate per acre ...	60 lb.	60 lb.	60 lb.	60 lb.	60 lb.
Remarks ...	Pinched grain in Geeralying and Waratah.	All yields reduced by take-all and loose smut; Ford was affected by frost.	Pinched grain in Geeralying and Aussie.	...	Plots particularly free of disease.
Varieties.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie ...	*‖¶26 10	...	‖28 29	...	...
Baringa ...	...	...	...	...	23 7
Bena ...	...	‖27 19	...	...	24 44
Bobin ...	¶31 43	...	33 0	...	...
Burrill ...	...	27 3	...	...	18 57
Cleveland ...	...	...	...	§¶19 43	...
Currawa ...	...	...	...	24 32	...
Duchess ...	...	...	...	...	...
Dundee ...	...	28 16	...	...	24 10
Duri ...	...	...	31 44	...	...
Federation ...	...	‖24 49	...	...	21 27
Free Gallipoli ...	...	...	...	25 58	...
Ford ...	...	27 21	...	...	25 28
Geeralying ...	*†19 10	...	28 33	...	...
Gluyas Early ...	*22 13	...	...	...	...
Marshall's No. 3 ...	...	...	...	24 40	...
Nabawa ...	...	27 44	...	...	19 10
Penny ...	...	...	...	§¶18 35	...
Rajah ...	31 57	...	34 14	...	...
Ranee ...	...	28 45	...	...	...
Riverina ...	24 23	...	27 24	...	...
Wandilla ...	...	...	...	¶21 31	...
Waratah ...	†¶23 19	...	‖29 53	...	...
Yandilla King ...	...	...	...	20 23	...

* Yields reduced by lodging. † Yields reduced by shedding. ‡ Yields reduced by take-all.
§ Yields reduced by foot-rot. ‖ Yields reduced by flag smut. ¶ Yields reduced by loose smut.

The rainfall registrations at Leeton and Corobimilla give a fair indication of the conditions that prevailed throughout the Yanco end of the Murrumbidgee Irrigation Areas and the Narrandera district.

Comments on Wheat Varieties.

Amongst the early-maturing wheats, Rajah, Bobin and Duri were outstanding on the dry areas. These three wheats are invariably amongst the best yielding varieties of this particular season. Geeralying, while showing disease-resisting qualities, was most disappointing this year owing to lodging, shedding, and a decided pinching of the grain.

Throughout both the dry areas and irrigable sections, Dundee, Ford and Baringa were the outstanding midseason wheats, and they displayed considerable resistance to flag smut, while Nabawa, although weak in the straw, yielded fairly well, and by reason of its resistance to disease must remain one of the most important wheats throughout these parts of the State.

Amongst the late-maturing varieties Free Gallipoli, Wandilla, and Yandilla King gave the best results. Free Gallipoli has in the past done better in the more southern parts of the Riverina, but this year it was the heaviest yielding late wheat on both plots where these varieties were tested.

An Oat Variety Trial.

An oats-for-grain trial was carried out on the property of Mr. T. C. Davies, Brobenah. The land was a red and grey clay loam to gravel; an old cultivation paddock which since 1926 has been used for grazing purposes only. It was mouldboard ploughed 4 inches July, combined October, disc cultivated March, combined April, and sown with drill on 28th April at the rate of 60 lb. seed and 60 lb. superphosphate per acre.

The seed bed was in good condition and moist, and excellent germination resulted. The plots, which grew tall, were in splendid condition until October and early November, when severe wind storms caused lodging of all varieties; consequently the yields of all varieties were reduced considerably. It was found impossible to strip Gidgee owing to it being badly tangled. Palestine was found the easiest to strip on account of being slightly shorter in the straw than the other varieties. The yields per acre were as follows:—

Variety.	Yield.	
	bus.	lb.
Buddah	37	20
Palestine	41	8
Mulga	34	20
Sunrise	27	30

Points for Growers on the Griffith End of the Area.*

The 1932 Season.

As far as the dry area portion of the Griffith end of the district was concerned the past season proved to be the best for a number of years past. There were practically no crop failures, but the year was not devoid of its anxious periods. In the early part the rainfall was meagre, and very high temperatures were experienced, and it was not until April, when heavy and general rains set in, that conditions became favourable for general sowing

* The information under this heading is from the report of Mr. E. B. Furby, H.D.A., Agricultural Instructor.

operations to commence. The sowing period was accompanied by good rains, and, generally, very satisfactory germinations were obtained. Fairly dry conditions prevailed during the winter, which was mild, and the actual setback which crops received was fully recovered following timely rains in the spring. The conditions during the ripening period were ideal, resulting in heavy, plump grain being harvested; harvesting weather was also ideal.

On the irrigation area it was not found necessary to apply water to the crops in the spring time, the rainfall being sufficient to carry them to maturity.

The rainfall at Griffith was as follows:—

During the Fallowing Period.—June (1931) 215 points; July, 80; August, 232; September, 65; October, 412; November, 102; December, 493; January (1932), 11; February, 154; March, 174; total on fallow, 1,928 points.

On the Crop.—April (1932), 256 points; May, 47; June, 104; July, 103; August, 240; September, 186; October, 16; total on crop, 852 points.

Total rainfall on fallow and growing crop, 2,780 points.

A comparison of the rainfall with that for the same periods of the previous season would lend some colour to the assertion that the success of wheat-growing on the dry area in this district is almost entirely dependent upon the incidence of the rainfall in the spring. Fallowing gives the added advantage of security during the dry winters.

The Wheat Variety Trials.

This season the presence of the usual diseases was not very marked. Flag smut was invariably seen in all plots, but the infection was so light as to have no influence on the yields.

Of the varieties under trial, Nabawa, Ford and Bobin, though not necessarily giving the highest yields in all plots, were regarded as the superior varieties generally, but an apparent weakness in the straw of Nabawa may cause this variety to lose some favour. It is still, however, the main variety grown.

Dundee was tried here for the first time, and gave a good yield in both plots; it was not over tall, carried a good productive head, and was almost entirely free from flag smut. Bobin is a variety much sought after and has given good consistent yields. In the plots it stood out in this regard and was fairly free from flag smut. It stripped better than it looked. Baroota Wonder can only be considered as a hay variety, and not even the best for that as the straw showed a weakness and the heads shattered.

Duchess performed better than in previous trials and indicated that it may possibly be suitable for early sowing only; the yield was good both on the dry and the irrigable areas. Bredbo was rather badly affected by flag smut; from the poor nature of its growth it deos not appear to be a suitable variety. Geeralying is a variety which has attracted some attention here,

good yields having been obtained from it. On the mallee soil it shed slightly. Its tall straw and early maturity would make it a suitable variety for hay; it was also practically free from flag smut. Currawa yielded well in both plots, stripping in each case better than appearance.

Amongst the varieties grown on the irrigation area, Yandilla King, Wandilla and Ford stand out for yield. The first two are difficult varieties to replace under irrigation conditions. The failure of Nabawa was not due so much to any weakness of the variety as to some local soil condition on this plot. Ford has gained some popularity as an irrigation wheat, standing up well to the water but not stripping as well as it appears.

CULTURAL Details and Yields of Wheat Variety Trials in the Murrumbidgee Irrigation Area (Griffith end), 1932.

	Dry Area.				Irrigation Area.
District	Griffith.	Yenda.	Yenda.	Tabbita.	Beelbangera.
Experimenter... ...	F. Holt.	A. J. Cruickshank.	T. H. Burcher.	A. A. Rewell.	V. A. Edwards.
Nature of soil... ...	Red loam ...	Red loam ...	Mallee ...	....	Red clay loam.
Ploughing	*September, 1931.	Disc, September, 1931.	Mouldboard, September, 1931.	Scarified, July, 1931.	Mouldboard, January, 1932.
Cultivation	Springtoothed December and April.	Only worked with harrows, combine sown.	Scarified early May; sown with disc drill.	Scarified August, again October, harrowed February, scarified early May; combine sown.	Watered end January and cultivated; combine sown.
Date of sowing ...	12 May ...	14 May ...	14–27 May ...	15 May ...	30 April.
Seed per acre ...	60 lb.	58 lb.	45 lb.	60 lb.	60 lb.
Superphosphate per acre	60 lb.	60 lb.	45 lb.	60 lb.	60 lb.
After treatment ...	....	....	....	....	Fed off in June.
Remarks	....	....	....	....	....
Varieties—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Nabawa	25 2	....	10 50	26 2	15 0
Federation	22 51	17 7	....	....	....
Duchess	26 40	....	....	....	21 0
Sepoy	25 0	27 41	10 38	28 40	....
Dundee	25 27	31 34	....	....	....
Ranee	25 31	....	....	18 23	....
Bobin	27 47	....	13 42	23 2	....
Waratah	21 33	....	....	....	....
Ford	....	21 0	13 40	22 52	21 0
Baroota Wonder ...	....	12 22	....	18 43	....
Geeralying	....	27 24	12 29	....	....
Bredbo	....	27 24	....	....	....
Free Gallipoli ...	....	30 0	11 31	....	....
Currawa	....	....	13 18	25 54	....
Turvey	....	....	9 37	....	19 0
Penny	....	....	....	25 11	....
Wandilla	....	....	....	....	25 0
Carinda	....	....	....	....	18 0
Cleveland	....	....	....	....	12 0
Yandilla King ...	....	....	....	....	20 0

* Prepared but not sown in 1931.

Rate of Seeding Trials with Wheat.

These trials were conducted only on irrigable lands, but the only plot irrigated in the spring was that of Mr. Prigeon. In this case the crop was sown on land which has been cropped for the previous seven years, and the results obtained might indicate the futility of exceeding the normal and usual rate of sowing. Mr. Dickie's plot was sown on "old rice land." The increased fertility of the soil as the result of growing a crop of rice appears to favour and call for a sowing in excess of the usual rate of about 60 lb. per acre. In the remaining plot the results were somewhat contradictory. The vagaries in the yields can be ascribed to irregular soil conditions and uneven watering prior to sowing.

The cultural methods were the same as for the wheat fertiliser trials on these farms and the yields were as follows:—

RATE of Seeding Trial with Wheat.

Rate of Seeding.	Yield.		
	Griffith (C. A. Long)	Bilbul (Dickie Bros.).	Yenda (J. A. Prigeon).
	bus. lb.	bus. lb.	bus. lb.
46 lb. per acre	29 37	......	26 38
52 lb. „	......	18 25	......
60 lb. „	24 40	16 48	26 8
73 lb. „	34 47	19 54	26 27
90 lb. „	24 57	24 0	25 30

Wheat Fertiliser Trials.

Fertiliser trials were conducted both on dry and irrigable areas. In both of the dry area plots considerable increases in yield have been obtained by the use of superphosphate. On the mallee plot the results indicate that heavy applications are not essential, on new land at any rate. Only one crop of wheat had been previously grown in this field. With the other plot, which was also comparatively new land, the difference between the no-manure and 87 lb. per acre plots was so marked that obviously some local influence other than fertiliser contributed towards the large increase in yield. Disregarding this plot, the results again show that moderate amounts of superphosphate are sufficient for all practical purposes.

With the irrigable plots the same conclusion was arrived at. Superphosphate is essential to maintain fertility, but it would appear that the soil management must be improved in other directions if a general increase in production per acre is to be looked for.

Cultural Details and Yields of Wheat Fertiliser Trials in the Murrumbidgee Irrigation Area (Griffith end), 1932.

	Dry Area.		Irrigable Area.		
District	Yenda.	Tabbita.	Griffith.	Bilbul.	Yenda.
Experimenter... ...	T. H. Burcher.	A. A. Rewell.	C. A. Long.	Dickie Bros.	J. A. Prigeon.
Nature of soil... ...	....	....	Red loam ...	Heavy red gilgai.	Red loam.
Ploughing	Same as on Wheat Variety trials on these farms.		Disc early January, 1932.	Mouldboard January, 1932.	Disc August, 1931.
Cultivation	....	....	Graded and watered mid-March; disc cultivated twice after watering; combine sown.	Harrowed, rolled, scarified and harrowed.	Graded and disc ploughed early November, spring-toothed three times, and rolled.
Date of sowing ...	27 May ...	15 May ...	6 May ...	4 April ...	18 May
Seed per acre ...	45 lb.	60 lb.	60 lb.	60 lb.	60 lb.
Remarks	....	....	....	Not irrigated prior to sowing or in Spring; rice previous crop.	Watered only in Spring.
Variety	Waratah ...	Waratah ...	Marshall's No. 3	Yandilla King	Marshall's No. 3
Fertiliser per acre—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
No manure ...	9 31	15 38	27 53	12 35	20 15
57lb. superphosphate	12 22	....	33 13	17 54	25 50
45 lb. " ...	13 28	27 0	....	....	....
67 lb. " ...	11 35	....	....	....	....
60 lb. " ...	....	27 44	....	....	....
87 lb. " ...	....	31 10	....	....	....
112 lb. " ...	....	....	31 30	18 33	27 54
140 lb. " ...	....	....	37 40	14 16	27 11

Oat Trials.

The oat trials were confined to the irrigable section, where oats are grown both for hay and grain, and at the same time used extensively for green feed. They are usually sown early in the season and fed off during the winter.

Details of the hay trials were as follows:—

Yenda (S. H. Kelly).—Soil, heavy red loam; sundercut March, 1931, irrigated in March, 1932, and scarified twice after watering; sown with disc drill on 31st May with 60 lb. seed and 56 lb. superphosphate. The yields per acre were as follows:—Algerian, 1 ton 1 cwt. 2 qr. 22 lb.; Sunrise, 1 ton 4 cwt. 0 qr. 7 lb.; Buddah, 1 ton 2 cwt. 2 qr. 10 lb.; Laggan, 1 ton 16 cwt. 2 qr.; Belar, 1 ton 15 cwt. 0 qr. 24 lb.; and Mulga, 1 ton 2 cwt. 8 qr. 10 lb.

Of the tested varieties cut for hay, Laggan and Belar proved to be the heaviest yields. Laggan, however, will not find much favour on account of the poor colour of the straw and the black appearance of the heads when ripe. It has a very fine straw, and would appear to be ideal for making into first-class hay if not allowed to become too ripe.

A variety trial for grain was conducted as follows:—

Griffith (E. D. Gregory).—Soil, red loam; disc ploughed 5 inches February, 1932, irrigated first week March, scarified 22nd March; sown with combine on 24th March with 60 lb. seed and 60 lb. superphosphate. The yields per acre were as follows:—College Algerian, 31 bus.; Lachlan, 10 bus.; Laggan, 11 bus.; Mulga, 15 bus.; and Belar, 17 bus.

Mulga sheds its grain too easily, and has not found much favour here on that account. College Algerian stripped very well, and appears to be an improvement on the old variety. The yields from the other varieties which were stripped were poor, harvesting being delayed.

Fertiliser trials with oats for hay and grain were conducted as follows:—

Yenda—J. Lyne (Hay Trial).—Soil, heavy red; prepared for lucerne 1930; ploughed September, 1931, disc cultivated March, 1932, sown 15th April with seed at 60 lb. per acre. Algerian variety fed off three times to end of August. Yields:—No manure, 3 tons 14 cwt. 1 qr. 4 lb.; 60 lb. superphosphate, 3 tons 13 cwt. 1 qr.; 90 lb. superphosphate, 3 tons 12 cwt. 1 qr. 7 lb.; and 120 lb. superphosphate, 3 tons 15 cwt. 0 qr. 12 lb.

Griffith.—E. D. Gregory (Grain Trial).—Soil and cultural details as in oat variety trial. The variety used was Algerian, and the yields were as follows:—No manure, 15 bus.; 56 lb. superphosphate, 18 bus.; 112 lb. superphosphate, 21 bus.; and 168 lb. superphosphate, 20 bus.

The fertiliser trial results were much the same as with wheat. The high yields obtained in the case of Mr. Lyne's plot were interesting on account of the extensive grazing the plots received. The land was originally prepared for lucerne following a heavy crop of rice. These results confirm previous experience that old rice land must be adequately worked before high yields can be expected.

Recent Publications of Interest to Farmers.

The following leaflets—some new and others revised editions of previously existing leaflets—have just come off the press, and are available to farmers interested. There is no charge. Address your requests to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney:—

"The Influence of the Mineral Constituents of Food on Animal Health."
"Green Feed Deficiency Disease in Fowls."
"The Fowl Tick."
"Spotted Wilt and Other Virus Diseases of Tomatoes."
"Sweet Potato Hawkmoth."
"Sweet Potato Weevil."
"The Banana Aphid."
"San José Scale."
"Banana Beetle Borer."
"Fruit Tree Moth Borer."
"Yellow Monolepta Beetle."
"Dicky Rice Weevil."

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Baringa	H. J. Harley, "Wattle Park," Tullibigeal.
	A. M. M. Paterson, "Greenhills," Delungra.
Bena	Manager, Experiment Farm, Cowra.
Bobin	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	H. J. Harvey, "Kindalin," Dubbo.
	D. W. Edis, "Prestonville," Ariah Park.
	A. L. Harnett, Quandialla.
	W. G. Law, "Thistledown," Gilgandra.
	H. J. Harley, "Wattle Park," Tullibigeal.
	E. J. Johnson, "Iona," Gunningbland.
	C. Condon, Box 9, The Rock.
	Cullen Bros., "Bunglegumbie," Dubbo.
Cadia	Manager, Experiment Farm, Bathurst.
Canimbla	Manager, Experiment Farm, Cowra.
Cleveland	W. Burns, "Goongirwarrie," Carcoar.
Dundee	A. D. Dunkley, "Bon Lea," Brundah, via Grenfell.
Duri	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Cowra.
Federation	C. Condon, Box 9, The Rock.
Ford	C. Bennett, "Theole," Forbes-road, Cowra.
	W. E. Ditchfield, West Wyalong.
	J. B. White and Sons, Boggabri.
	A. D. Dunkley, "Bon Lea," Brundah, via Grenfell.
Nabawa	Manager, Experiment Farm, Condobolin.
	Mark Sharman, "Mabruk," Erigolia.
	David Bolte, "Lincluden," West Wyalong.
	W. G. Law, "Thistledown," Gilgandra.
	G. T. S. Troy and Sons, "Fairfield," Quandialla.
	C. F. T. Anderson, "Swan Vale," *via* Glen Innes.
	H. J. Harley, "Wattle Park," Tullibigeal.
	E. J. Johnson, "Iona," Gunningbland.
	Cullen Bros., "Bunglegumbie," Dubbo.
	J. B. White and Sons, Boggabri.
Pusa No. 111	Mark Sharman, "Mabruk," Erigolia.
Pusa No. 163	Mark Sharman, "Mabruk," Erigolia.
Queen Fan	C. F. T. Anderson, "Swan Vale," *via* Glen Innes.
Riverina	Cullen Bros., "Bunglegumbie," Dubbo.
Wandilla	Manager, Experiment Farm, Cowra.
	W. G. Law, "Thistledown," Gilgandra.

Wheat—continued.

Waratah	G. T. S. Troy and Sons, "Fairfield," Quandialla.
	E. J. Johnson, "Iona," Gunningbland.
	H. J. Harvey, "Kindalin," Dubbo.
	Manager. Experiment Farm, Bathurst.
	C. Condon, Box 9, The Rock.
	J. B. White and Sons, Boggabri.
Yandilla King	Manager, Experiment Farm, Cowra.
	David Bolte, "Lincluden," West Wyalong.
	A. L. Harnett, Quandialla.
	A. E. Dixon, "Bramshott," Wallendbeen.
	A. D. Dunkley, "Bon Lea," Brundah, via Grenfell.
Oats—	
Algerian	W. Burns, "Goongirwarrie," Carcoar.
	C. Bennett, "Theole," Forbes-road, Cowra.
Belar	Manager, Experiment Farm, Condobolin.
Buddah	Manager, Experiment Farm, Cowra.
Burke	Manager, Experiment Farm, Cowra.
Gidgee	Manager, Experiment Farm, Cowra.
Guyra	Manager, Experiment Farm, Bathurst.
Kendall	Manager, Experiment Farm, Cowra.
Laggan	Manager, Experiment Farm, Cowra.
Mulga	C. Bennett, "Theole," Forbes-road, Cowra.
Potato ("Certified" and "Standard" Seed)—	
Carman	Secretary, Potato Growers' Association, Bannister.
	Secretary, Pototo Growers' Association, Millthorpe.
Early Carman	Secretary, Potato Growers' Association. Millthorpe.
Early Manhattan ...	Secretary, Potato Growers' Association, Millthorpe.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Factor	Secretary, Potato Growers' Association, Bannister.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Batlow.
	Secretary, Potato Growers' Association. Millthorpe.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
	Secretary, Potato Growers' Association, Taralga.
Gold Coin	Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Late Manhattan ...	Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Queen of the Valley ... (Standard grade only.)	Secretary, Potato Section, Rural Co-operative Society Ltd., Batlow.
Satisfaction	Secretary, Potato Growers' Association, Taralga.
Cauliflower—	
Mitchell's No. 4	C. J. Rowcliff, Old Dubbo road, Dubbo.
Onion—	
Hunter River Brown Spanish.	S. Redgrove, "Sandhill," Branxton.
	C. J. Rowcliff, Old Dubbo Road, Dubbo.
Hunter River White Globe	C. J. Rowcliff, Old Dubbo road, Dubbo.
Tomato—Strains of tall "Chinese Red," chiefly for glass-houses—	
Australian Large Red ...	Manager, Experiment Farm, Bathurst.
Bendigo Large Red ...	Manager, Experiment Farm, Bathurst.
Boyd's Intermediate ...	Manager, Experiment Farm, Bathurst.
—*Other Varieties*—	
Improved Sunnybrook Earliana	A. Sorby, Macquarie Fields.
Break-o'-Day	A. Sorby, Macquarie Fields.
Pea—	
Greenfeast	P. Morandini, Bunglegumbie-road, Dubbo.

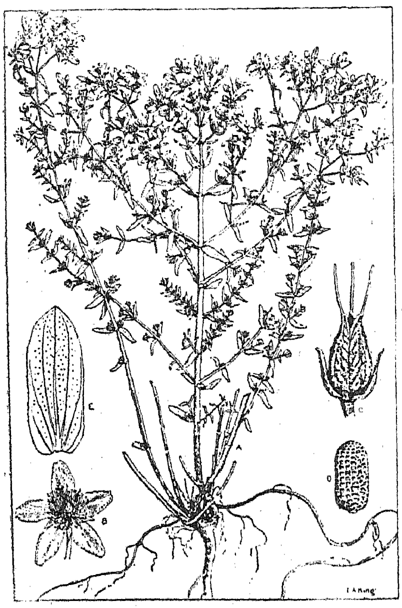
A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Eradication of St. John's Wort.

SUBTERRANEAN CLOVER WILL CHOKE IT OUT.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

ST. JOHN'S WORT (*Hypericum perforatum*) is a most troublesome weed in some parts of the State, particularly in districts with temperate climates. The main districts affected are Tumbarumba, where approximately 5,000 acres of land are infested, and Mudgee, where the weed has overrun about 1,500 acres.



St. John's Wort (*Hypericum perforatum*).
A—Plant, showing habit and creeping root-system.
B—A solitary flower, showing 5 petals and numerous stamens.
C—Fruit, showing 3 valves and styles.
D—Seed.
E—A leaf, showing oil-dots.

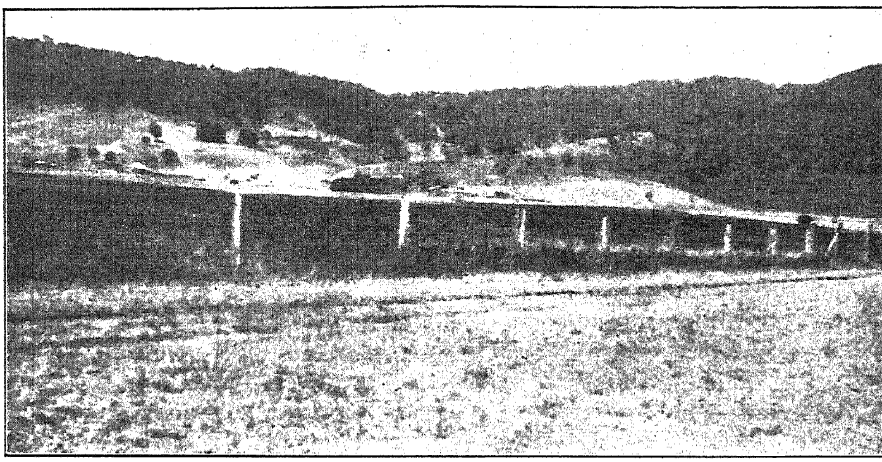
St. John's Wort is a perennial of deep-rooting habit, the roots penetrating from 2 to over 4 feet deep. It is propagated by means of seed and short runners from the base of the stem. When conditions are favourable the weed rapidly spreads and crowds out the natural grasses, and some lands on which the weed has become firmly established have had to be abandoned.

Stock will eat the weed, especially in the young stages, but it contains an active principle which has a very serious effect on stock that are grazed on the weed for some time. Light-coloured parts of the skin are rendered peculiarly sensitive to sunlight, causing a severe itch, and as the result of rubbing and biting the parts swell and bleed. The nervous system is also affected, causing either depression or intense excitement, and death sometimes results if feeding is persisted in.

Sodium Chlorate is Effective but Expensive.

For several years the Department has conducted experiments to ascertain an effective means of control. A number of chemical sprays have been tested, and the best was found to be sodium chlorate in a solution of 1 lb. to 1 gallon of water. This method, however, while being of value in destroying small patches of the weed and thus preventing its spread, is so costly as to be prohibitive when dealing with heavy infestations.

In the early experiments the plants were sprayed when they were in full blossom, this stage generally being the most effective time for the spraying of most weeds, but in order to ascertain whether the cost of spraying could be reduced, further experiments have been carried out with spraying in the winter before the flower stalk is formed. As the amount of vegetation is then less, a greatly decreased quantity of solution is necessary to cover the plants thoroughly with the spray. The experiment was conducted at Mudgee under the supervision of the district agricultural instructor, Mr. G. Nicholson, and the sprays were applied in July, 1932. The plots were sprayed with weaker solutions and at lower rates of application than had previously proved effective. The results of the tests indicate that a solution of 1 lb. of sodium chlorate to 1 gallon of water, applied at the rate of 150 gallons per acre in July, is most effective in destroying St. John's Wort. This should be followed with a light spraying in the spring to destroy any plants that may have escaped the first spraying.



Definite Evidence of the Value of Subterranean Clover.

Subterranean clover was sown in the paddock in the foreground and it has choked out the weed, while along the fence and in the next paddock (where subterranean clover was not sown) St. John's Wort forms a dense mass that is knee high. There is no feed at all underneath the weeds.

Subterranean Clover is Effective and Economical.

For dealing with large areas badly infested with St. John's Wort, subterranean clover has been proved very effective in controlling the weed at small cost. Experiments of this nature have been in progress at Tumbarumba since 1929, where an area of land densely infested with the weed was ploughed 5 inches deep in October, 1928, and sown in March, 1929, with 8lb. subterranean clover and 100 lb. superphosphate per acre, and the clover top-dressed in March each year since with 1 cwt. superphosphate per acre.

In view of the success achieved, and with the object of further reducing costs, another area was sown with half the quantity of subterranean clover

seed (4 lb. per acre) and 1 cwt. superphosphate per acre in March, 1931. After a recent inspection by Mr. G. C. Bartlett, district agricultural instructor, who supervised the experiments, he reported that the effectiveness of the control resulting from the 4lb. seeding was equal to that from the heavier sowing, and on both areas only about 1 per cent. of plants of St. John's Wort had survived, and these were weak and stunted.

Thus, not only has the St. John's Wort been suppressed, but it is replaced with a succulent pasture at small cost, and the carrying capacity of the land has been improved to a remarkable degree. It should be noted that to ensure the efficacy of this method it is essential to top-dress the subterranean clover regularly each year in the autumn with at least 1 cwt. superphosphate per acre, as this greatly stimulates the growth of the clover and assists it to smother the weed.

So-called Guano that is Mostly Ground Shells.

The Department has evidence that farmers on the north coast are being victimised by a company which is carrying on operations in that district in connection with the supply of what is alleged to be "guano." A sample of material purchased as guano by a grower on the north coast was recently submitted to the Department, and on being analysed it was found that it certainly was not guano. As a matter of fact, its chemical composition and appearance indicated that it consisted almost entirely of ground shells. Its principal constituent was carbonate of lime, of which it contained about 90 per cent., but there were only mere traces of the fertilising elements phosphoric acid, potash, and nitrogen.

While such a product as that represented by the sample analysed might be used for supplying lime to the soil where that treatment is necessary, it is practically valueless as a direct fertiliser. Notwithstanding this, the Department understands that material of the description referred to is being sold for as much as £6 to £9 per ton. If this is the case growers will readily be able to realise how they are being victimised when it is considered that the Department's estimate of the value of the material as carbonate of lime is about 18s. to 19s. per ton at the point of production.

It is also understood that growers are being canvassed to purchase shares in the company, and some no doubt have done so, believing that the proposition had possibilities in view of the fact that there is a considerable demand in the district for fertilisers.

Farmers can guard against such deception as the above by insisting upon their rights under the Fertilisers Act, 1904, which makes it obligatory upon vendors to furnish the purchaser, on or before delivery of the fertiliser, with a statement showing its nature and quantities of chemical constituents. The guarantee should show the percentages of nitrogen, phosphoric acid and potash, and where the vendor certifies that readily available phosphoric acid is contained, the percentage content of water-soluble and total phosphoric acid should also be shown in the certificate.

Honey Bees in Relation to Lucerne Seed Setting.

R. E. P. DWYER, B.Sc.Agr., Assistant Plant Breeder, and S. L. ALLMAN, B.Sc.Agr., M.S., Assistant Entomologist.

Introduction.

THE question of the role of honey bees and other insects in their relation to lucerne seed setting has been investigated at Bathurst Experiment Farm. This district is not altogether typical of the best lucerne seed producing areas in New South Wales, but a satisfactory setting of seed is obtained in many seasons. It is generally assumed that tripping is a necessary prelude to seed setting whenever lucerne is grown, except in Utah under arid conditions, where Carlson[4] records a considerable seed setting without tripping. Under the conditions prevailing at Bathurst it has been definitely found that honey bees are important agents in tripping the flowers and increasing the seed of lucerne. It is also considered that honey bees play an important part in the seed setting of lucerne in the districts where seed is produced commercially.

Review of Literature.

Henslow,[12] on the authority of Piper[16] in his work published in 1867, stated that the honey bee gathered nectar from the flowers but did not cause tripping. Urban, also on the authority of Piper,[16] some six years later concluded that honey bees caused pollination only. Burkill[3] observed honey bees tripping lucerne flowers on two occasions. Brand and Westgate[2] reported that pollination may be accomplished by bumble bees and honey bees, of which the former were the more efficient.

Piper *et al*[16] concluded that the honey bee caused tripping to a limited extent only, although gathering a quantity of honey. Sladen[17] stated that honey bees, although plentiful, visited the flowers without causing any tripping. Blinn[1] reported that from the results of his investigations there existed no clear evidence that bees were essential to lucerne seed production.

Whittet[20] reported that it is often stated by growers that "unless bees are working freely in a crop intended for seed purposes, very little seed will be set." He further stated that although tripping occurs naturally in some flowers, it is much more often brought about by the intervention of insects.

Hill[13] points out that although honey bees are prevalent in lucerne fields at flowering time, their presence is merely an indication that an abundant supply of nectar is available and that the flowers are in a condition favourable to a good seed crop. He considers that the honey bee will trip a small percentage of flowers and thus effect a small amount of cross-fertilisation. The absence of bees was not considered a detriment to a good seed crop.

Gray[10] stated that the honey bee does not possess a tongue long enough to reach the bottom of the corolla tube when introduced over the top of the keel. This has resulted in its insertion at the side of the keel, and only on one occasion was tripping actually observed by this means, although on several occasions this result was achieved by the bees crawling over the blossoms. He concludes that the honey bee is practically useless from the standpoint of lucerne seed production.

Lovell[14] stated that statistical observations made by competent observers show that as a pollinating agent of alfalfa the honey bee is of very little importance, and that claims to the contrary have not in a single instance been based on statistical experiments. He also stated that Mueller, working in Germany, did not once observe a honey bee trip a single lucerne flower, while Stevens in Kansas observed honey bees to trip nine out of 584 flowers visited.

Fleischmann[9] stated, as the result of his observations, that tripping of the lucerne flower is effected by honey bees and certain wild types of bees, the lion's share, however, falling to the honey bees. He stated that good seed crops are obtained on certain farms in Alfold, Hungary, where bee-keeping is also practised. McClymonds[15] stated that, although honey bees were observed on many occasions gathering nectar, in no case did he see a flower tripped by them. He indicated, however, that under favourable conditions they may cause a limited amount of tripping. Southworth[18] came to the same general conclusions as quoted by Piper,[16] namely, that the principal agents of cross-pollination are various species of wild bees, and that honey bees trip only a small percentage of flowers.

Helmbold[11] observed that during the course of his investigations honey bees were not once seen to trip lucerne flowers in the course of their nectar seeking. They avoided tripping by driving their tongues in at the sides and at the base of the flowers. Carlson and Stewart[4,5] state that only a relatively small percentage of flowers become tripped, and that in the Uintah Basin, Utah, the lucerne flowers are capable of setting pods freely in the absence of tripping. Engelbert[8] states that honey bees are no longer thought to be of importance in the tripping of lucerne flowers.

From a study of the above literature, it is evident that a very considerable diversity of opinion exists concerning the importance of the honey bee in relation to lucerne seed setting. Observations have definitely established the fact that they may cause a limited amount of tripping, but this is generally considered quite subordinate to that caused by various species of bumble and leaf cutter bees. In the main, they are generally considered of little importance. In the majority of cases, the statements concerning honey bees are merely expressions of opinions without any definite data concerning their importance one way or the other.

Observations During the 1930-31 Season.

Repeated observations at Bathurst[6,5] failed to indicate any ability on the part of honey bees for tripping lucerne flowers until 25th February, on which date they were observed apparently to effect this on seven occasions.

Subsequent observations confirmed this, and on the morning of 10th March a count revealed that of 147 flowers visited thirty-three, or 22.45 per cent., were tripped. On this morning a single individual tripped eleven, or 64.71 per cent., of the seventeen flowers visited under observation. On the afternoon of the same day only two of 100 flowers visited by bees were tripped.

In order to estimate to what extent tripping had taken place under these conditions, counts were made. These showed that 18 per cent. of the matured flowers were actually tripped. Although the possibility of tripping by other means must not be overlooked, the close observations necessary to obtain these figures failed to reveal any such tripping, and the opinion was therefore formed that honey bees were responsible for this amount of tripping.

It was concluded that, under conditions obtaining at Bathurst, although more effective tripping agents might later be observed, the honey bee, by virtue of its numbers and its ability to trip a considerable percentage of flowers visited, constituted the main insect agency for tripping and possibly cross-pollination of lucerne flowers.

Observations During the 1931-32 Season.

A caging experiment was designed with the idea of proving definitely that, under certain conditions, the honey bee may materially influence tripping and seed production of lucerne. Four adjacent rows of plants, each row representing root divisions of separate clonal strains, were selected for the test. Plants of each of these four clonal strains were included under two cages, measuring 12 feet by 12 feet by 6 feet in height, consisting of an iron framework covered with wire gauze overlying cheese cloth. A similar plot of uncaged plants growing under natural conditions was selected to act as a standard for additional comparison. A number of racemes on each plot were selected, and records were taken of the number of blossoms examined for the purposes of the test. A hive of bees was placed under one cage, and the resultant seed setting was later compared with that obtained under both the caged and the natural conditions in the other two plots. The cages were placed in position on 10th November and removed three weeks later when blossoming had finished and pod formation had begun. The results of this experiment are set out in the following two tables:—

TABLE I.—Results of Caging Experiments (Flowers Mature at commencement of experiment).

	Cage 1—With Bees.	Cage 2—Without Bees.	Uncaged—Natural Conditions.
Number of racemes	220	220	54
Number of flowers	4,340	3,650	1,050
Number of seed pods set	1,185	9	182
Per cent. flowers which set seed pods	27·39	0·25	17·32
Number of seeds formed	3,189	12	425
Number of seeds per pod	2·6	1·3	2·4
Per cent. shrivelled seeds	1·13	55·56	36·71

A further count was taken on flowers which developed to maturity subsequent to the original blossoms included in the count at the beginning of the experiment. These flowers thus constituted a random sample in each of the plots under discussion.

TABLE II.—Results of Caging Experiments (Flowers which matured subsequently).

	Cage 1—With Bees.	Cage 2—Without Bees.	Uncaged—Natural Conditons.
Number of seeds per fifty racemes	1,767	163	961
Number of seeds per pod	2·9	0·13	2·71
Per cent. set compared with natural set ...	183	16·9	100

From the above tables it will be seen that the resultant seed set shows a significant increase in the case of the cage containing the bees, and this was even better than that obtained under normal conditions. The results in the second table confirm the findings set out in that detailing the results from the original blossoms. It is also noteworthy that the percentage of plump seed was far greater in the pods from the cage containing bees than from the pods obtained under natural conditions. This fact is even more noteworthy when it is remembered that according to many investigators the environment under a cheesecloth cage is not suitable for good lucerne seed setting.

It appears from the data recorded that very little automatic tripping occurred during the course of the experiment, as demonstrated by the lack of seed pods from the plants within the cage without bees. It is therefore at once evident that the presence of bees was the determining factor in the increase of seed pods as far as the two cages were concerned. As different conditions were experienced in the uncaged standard plot, other factors may be involved, but repeated observations proved that honey bees were working freely in this plot, thus indicating at least one common factor. The fact that a very strong hive of bees containing three supers was confined to a relatively small cage was largely counterbalanced by a great mortality and unwillingness to work on the part of bees. The superior setting within the cage containing the bees over the natural standard is thought to be due to greater honey bee activity. This activity could not, however, be expected to reach the 100 per cent. efficiency which might seem probable by the confining of such a large number of bees within a small cage.

During the course of the experiment, flowers within the cage were constantly tripped under observation, and it was very apparent that under the conditions described the honey bee displayed a very considerable tripping ability.

Very little lucerne seed has been recorded over the past four years on lucerne plants caged in various ways at Bathurst. Tripping of the flowers

by hand greatly increased the amount of seed set, thus indicating that tripping by some agency under similar conditions is necessary for an appreciable seed set.

Temperature and Rainfall Records.

The 1931 season was not particularly favourable for lucerne seed production in most parts of New South Wales. The conditions under which this caging experiment was carried out at Bathurst were also unfavourable for high seed production, as the rainfall was rather too high, resulting in profuse growth, and the temperatures were not optimum.

PARTICULARS of Temperature Records during the period of Caging.

	Average.	Lowest.	Highest.	No. of days over 90 deg. Fahr.
	Deg.	Deg.	Deg.	
Minimum (inside cage)	46	34	55	......
Minimum (terrestial)	43·8	34	59	......
Maximum (inside cage)	77	66	92	2
Maximum (standard louvred box) ...	72·7	55	87	......
Maximum (in direct sunlight) ...	87	72	106	8 (three above 100 deg. Fahr.)

The temperatures prevailing inside the cage were uniformly higher than those of the standard louvred boxes, this being particualrly evident in the case of the maximum temperatures. The maximum temperatures taken in direct sunlight ranged from 5 to 17 degrees higher than those recorded inside the cages. From previous experience it was found that the air within the cages was little affected by winds, and usually appeared more humid.

The rainfall for the year 1931 was 27.28 inches, approximately 4 inches higher than the average. During the actual caging period, 9th November to 1st December, 97 points in six days were recorded, the main falls, each of about 40 points, occurring on two days. Prior to caging a fall of 56 points was recorded, and in the month of December, following the removal of the cage, 339 points of rain fell.

It will thus be seen that although no heavy falls occurred about blossoming time, frequent light rains ensured a fairly high humidity.

Mode of Access to the Nectary.

A very noticeable difference of approach to the flowers was apparent in the case of individual bees. The majority of bees, as has been recorded by numerous investigators, insert their tongue at the side of the flower, and in this manner cause but little stress to the flower parts. A number, however, gained access to the nectary from above the keel, thus forcing their heads against the standards of the flowers, and in such cases tripping was frequently accomplished. In some instances the bees remained trapped by

their tongues, due to the pressure exerted by the curved staminal column, and in their endeavours to release themselves caused a visible dispersion of pollen.

Honey Bees in Relation to Pollen Dissemination.

As the honey bee visits mainly untripped flowers and is often visibly dusted with pollen, an examination of 100 untripped flowers was undertaken for the presence of pollen on the standards. This examination revealed the presence of pollen on the standard of each of the flowers investigated, thus indicating the possibility of wholesale cross-pollination even where tripping is purely automatic. Although it is considered that the honey bee figures largely in this dissemination of pollen, other insects and agencies, such as wind, acting in conjunction with tripping, also play their part.

Investigators generally agree (*vide* Piper,[16] Carlson,[4] Torsell, etc.), that cross-pollination leads to an increased seed set as compared with self-pollination, and thus where honey bees are instrumental in pollen dissemination they may influence the resultant seed crop beyond the figures indicated by the percentage of flowers actually tripped by them.

Climatic Considerations.

The importance of climatic and other conditions in rendering the lucerne flower susceptible to tripping by honey bees must not be overlooked, and the opinion is expressly stated that under such favourable conditions the honey bee may play a very important role in lucerne seed-setting. The fact that most investigators have not observed frequent tripping of lucerne flowers by honey bees must not be taken as absolute proof of their inability to perform this action. It indicates, rather, that the conditions, both climatic and environmental, and consequently the physiological state of the plant, were not such as to render the flowers susceptible to tripping by honey bees, although other types of insects were capable of releasing the tripping mechanism under the conditions prevailing. Thus during the past season two species of heavy-bodied Scoliid wasps were observed tripping lucerne flowers early in the morning when honey bees were visiting the flowers, without causing any tripping.

It is stated (see Piper[16] and Carlson[4,5] that under conditions prevailing in hotter and more arid areas, pod formation following automatic tripping or even without tripping is common, and under these conditions insects are not considered important. It seems that good seed setting depends largely on the tripping of the flowers which takes place naturally to a more pronounced degree under favourable climatic conditions. Where unfavourable environmental conditions upset the delicate balance known to exist between climatic conditions and the seed setting of lucerne, the honey bee and other insects may have a strong determining influence on seed setting. Thus under conditions not entirely favourable to natural tripping and seed setting, these

insects may play a very important role. Their actual value under suitable conditions for good seed crops has not been proven experimentally. It is reasonable to expect that, in areas more favourable to lucerne seed setting than at Bathurst, these insects would still exert a considerable influence, although moderate crops, by virtue of other favourable conditions, might be obtained without their influence.

Experiences of Local Seed Growers.

Lovell,[14] writing of American conditions, observes that from time to time beekeepers have declared that the introduction of colonies of bees has greatly increased their alfalfa seed crops. This he classifies as mere guesswork which often leads to erroneous conclusions. He indicates the pronounced seasonal variations in seed crops, and states that if bees were introduced in a poor season and the following year a good seed crop was obtained, this may be wrongly attributed to the influence of bees, whereas a good crop would have been secured in their absence.

The opinion is quite freely expressed amongst local growers of lucerne seed that the honey bee plays an important part in determining good or bad seed crops. The actual experiences of certain growers are given below, as they are of more value than a mere expression of opinion. The facts given were obtained in responses to a questionnaire dealing with the various phases of this investigation, and owing to considerations of space the numbers are necessarily limited.

Mr. A. J. Dix, of Rylstone, states that under favourable climatic conditions bees exert a very considerable influence on the seed crop. He further states that, even under favourable climatic conditions, when the native apple trees (*Angophora* spp.) are in bloom, the lucerne crop is not left for seed, as the bees prefer this blossom and do not work in the lucerne fields. A similar selective preference for various plants on the part of honey bees is recorded by Travin[19] in his work dealing with red clover seed production.

Mr. L. Biddulph, of Canowindra, Lachlan Valley, gives the following figures for his lucerne seed production. In 1929 a seed return of twenty-five bags from 22 acres was obtained in the absence of any hives of bees. This was followed next year by eighty bags from 31 acres when forty hives of bees were placed in close proximity to the lucerne fields. This increase in yield, representing approximately one bag per acre, is very significant, especially when one bag per acre is commonly regarded as an average yield. Unfortunatly, a plague of grasshoppers destroyed the crop the following season, and it was therefore impossible to note whether this improvement was maintained and due to the influence of honey bees.

Mr. F. McTackett, of Baerami Creek, on the head waters of the Hunter River, states that good crops were obtained when bees were working abundantly at the flowers. His two best seasons were those in which eighty hives of bees were placed in the lucerne fields.

Mr. Dix, junior, of Upper Bylong Valley, made the very interesting observation that he had seen bees actually trip blossoms by simply crawling over them. This occurred in bright sunlight following a light shower of rain.

Mr. Forth, a beekeeper in the Young district has provided some valuable observations indicating that the honey bee has a very favourable influence upon the lucerne seed set in that district. He was approached by a local grower to leave at least twenty hives of bees near a lucerne seed area. Although this particular grower had been trying for seven years to obtain a lucerne seed crop, the first crop harvested was in the year in which bees were introduced. The next season, although seventy hives were placed near the same area, the lucerne seed crop was a failure, although a good crop of honey resulted. This was attributed to climatic conditions and to the preference displayed by the honey bees for the flowers of the variegated thistle (*Marianus* sp.), on which large numbers were seen working. During the past season eighty hives were included in the area, and the seed crop was the best ever obtained in this locality, although the honey production was rather low.

The growers of the Bylong, Coolah, and Lachlan Valleys have practically all maintained bees or sought beekeepers to place their hives near their seed cropping areas. It was apparent that the only insects present in sufficient numbers to exercise any great influence were the honey bees.

Summary.

1. A wide diversity of opinion exists with regard to the ability of the honey bee to trip lucerne flowers or influence seed production.

2. Individual bees have been observed under Bathurst conditions to trip up to 64.71 per cent. of the lucerne flowers visited.

3. As a result of a caging experiment the honey bee was definitely proved to be capable of tripping a large percentage of lucerne flowers and influencing the amount of seed actually formed.

4. The seed from the cage containing the bees was of better quality and more abundant than that obtained under natural conditions, which may be largely owing to the influence of more efficient cross-pollination between the four clonal strains due to increased honey bee activity.

5. Practically no seed was formed in the cage without bees.

6. The importance of climatic and environmental conditions, and the physiological condition of the plant, must not be overlooked, and the efficiency of the honey bee may vary according to suitability or otherwise of these conditions.

7. Where investigators have failed to observe tripping of lucerne flowers by honey bees, this does not constitute absolute proof that such tripping is not possible. It indicates rather that the flowers were not in a suitable physiological condition, and so were not susceptible to tripping by honey bees.

8. The experience of a number of successful local seed growers are detailed with reference to the activities of honey bees and their ability to increase the commercial seed crop under New South Wales conditions.

9. The results obtained indicate the necessity for providing sufficient hives of honey bees in close proximity to lucerne seed areas in New South Wales.

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Insect Pests of Tobacco.

T. McCARTHY. Senior Assistant Entomologist.

A NUMBER of species of insects have been recorded attacking tobacco plants, both in the seed-bed and in the field. Often the most serious damage occurs in the seed-beds where but comparatively few insects may destroy the whole bed and necessitate re-sowing; the tobacco leaf-miner is perhaps the most serious in this respect. The cutworm, the elephant beetle, the budworm and the tobacco thrips may also cause much damage in the seed beds and in the field.

Three of these insects—the tobacco leaf-miner, the tobacco budworm and the cutworm—are dealt with in this issue, while the others will be featured in the June number.

The Tobacco Leaf-miner.

THE tobacco leaf-miner is a world-wide species which commonly attacks tobacco and other plants. It is probably better known to most growers as the potato moth, because of the injury caused by the caterpillars burrowing into the tubers. As a tobacco pest it is most injurious to plants in the seed-beds, though it is also found in the field, plants often being already infested when transplanted.

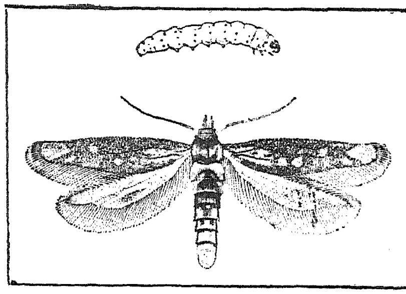
Young plants in the seed-bed are injured by the caterpillars feeding under the epidermis of the leaves, eating parts of the green tissue and causing transparent blister-like areas. All the leaves of a young plant may be severely damaged in this manner, and plants thus damaged are seldom suitable for transplanting.

It frequently happens that the seed-beds become heavily infested, and the damage may be so serious that the growth of the plants is retarded and it is almost impossible to obtain sturdy seedlings for transplanting. Provided that the plants are not infested when transplanted, damage in the field is comparatively slight, and usually confined to the older leaves near the ground.

The adult insect is a small, grey moth, having a wing expanse of about ½ inch. The eggs, which are laid singly on the leaves, hatch in five days. The caterpillars, which feed for twenty-six days, are greenish-grey in colour and about ½ inch in length when full grown. The pupal stage follows, and after about eleven days the adult moth emerges, the complete life cycle from the laying of the eggs to the emergence of the adult moths having taken approximately six weeks. Several broods may therefore occur during the season, and unless control measures are undertaken the infestation may become progressively worse.

The control of this pest must be undertaken in the seed-beds in order that an abundant supply of strong, uninfested plants will be available for

transplanting. The fact that the caterpillar frequently leaves one leaf to enter another makes it susceptible to control with arsenicals. Because the plants are usually closely massed together in the beds, dusts are preferred to liquid sprays, and a 50 per cent. arsenate of lead dust is recommended. Applications should be made at weekly intervals, commencing when the two primary leaves are about ¾ inch long. The dust is best applied with a small hand dusting machine. Where a dusting machine is not available some control can be obtained by spraying with arsenate of lead at the rate of 1 lb. to 40 gallons of water.



The Tobacco Leaf-miner (Enlarged):
Above.—Larva.
Below.—Adult.

It is important that no crops of similar character, such as potatoes or tomatoes, be grown near the tobacco seed-beds, neither should solonaceous weeds be permitted near the beds, as these make excellent sources of infestation.

The Tobacco Budworm.

Next in importance is the tobacco budworm, better known as the maize and tomato caterpillar. This worm feeds upon the mature foliage and bores into the young terminal shoots or buds, the latter being the more serious form of injury, since damage to the buds causes distorted leaves, retards the normal growth of the plants, stimulates the growth of the lateral buds, necessitating desuckering and consequent loss of time, while this irregular lateral growth causes variability in the size of the leaf and makes harvesting operations difficult.

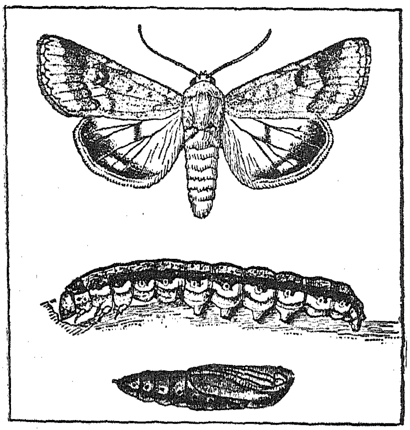
The tobacco budworm, which attacks a wide range of plants, including maize, lucerne and tomatoes, passes through four stages in the course of its development, viz., egg, caterpillar, pupa, and adult moth. The adult moth, which shelters among the leaves of the plant during the day, has a wing expanse of about 1½ inch. Its colour varies considerably, but is generally buff to reddish-brown, with indistinct darker markings on the fore wings and a black patch on the outer margins of the hind wings, which are whitish in colour. The moths are inactive during the day, but when disturbed make short, sharp flights.

The eggs, which are usually laid at dusk, are yellowish-white in colour, and are laid singly on the foliage; they hatch in about four days. The caterpillars, which reach maturity in three weeks, are about 1½ inches in length when full grown. Some are pale-green to dark-green; others are pale-yellow with brownish markings, while others again are buff-coloured with broad brown stripes. Soon after becoming full grown they enter the soil, construct earthern cells, and transform to the pupa, from which the

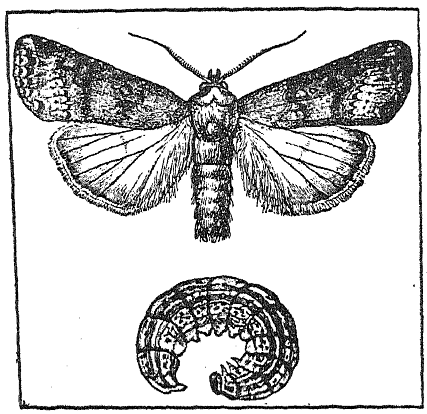
moth emerges after about ten days. The moths live for two or three weeks, during which time an immense number of eggs may be laid by a single individual.

By far the greatest amount of damage is done by the caterpillars when they are approaching maturity; consequently control measures when carried out while the caterpillars are small give the best results. In the first place a close watch should be kept on the seed-beds for the caterpillars, and if they are found to be present, or damage to the young plants has occurred, the bed should be sprayed with arsenate of lead (1½ lb. to 50 gallons of water), or dusted with a 50 per cent. arsenate of lead dust.

In the field, indiscriminate dusting of the plants does not give the best control, and in addition may leave an undesirable deposit of arsenate of lead on the leaves, especially if the dusting is continued after topping. The most efficient control of the budworm in the field is obtained by the direct application of the poison to the buds. The mixture recommended in most countries consists of 1 lb. of arsenate of lead and 75 lb. of corn



Tobacco Budworm.
Moth, larva and pupa.



A Cutworm Moth and Larva.
[*After* Howard.

meal. In mixing the bait care should be taken to obtain an even distribution of the poison throughout the corn meal. It is probable that pollard, or even lime mixed with the lead arsenate, would also give good results if corn meal is unobtainable, although the efficiency of the corn meal mixture is said to be due to the attractiveness of the corn meal to the caterpillars.

The corn meal mixture may be applied to the buds with a tin with a finely perforated lid. As the plants grow the buds are generally more tightly folded, and it is then necessary to partly open the buds with one hand and drop a pinch of the mixture into the bud. At least one application per week is often necessary to protect the plants fully, but the number of applications will depend upon the incidence of the grubs.

In some years the budworm caterpillars appear in enormous numbers in adjoining weed growth, and under certain conditions may migrate to the seed-beds. Invasions of this kind may be prevented by ploughing a deep furrow round the beds with the steep side next to the plants or by placing galvanised-iron sheets end to end around the beds.

When all the tobacco is harvested all fields should be thoroughly cleaned up, as plants left standing in fields provide a breeding ground for the various species that attack tobacco plants.

Cutworms.

Cutworms attack tobacco plants, both in the seed-bed and in the field, but while a comparatively limited number of cutworms are capable of destroying a large number of the young plants in the beds, they do not do serious damage in the field unless they occur in considerable numbers.

The caterpillars are the larvae of Noctuid moths. They feed upon any green and succulent plants, and, apart from their natural food, which consists of weeds and grasses, they attack a wide range of cultivated plants. The caterpillars feed at night, cutting through the stems of the young plants at the ground level, causing them to fall over—hence the reason they have become known as cutworms. Later, when the plants are older and the stems are thicker, the caterpillars succeed only in gnawing the stems or destroying the foliage. They hide in the soil near the base of the plant during the day.

Cutworms are extremely variable in colour and size, but can be said to be soft-bodied, smooth, cylindrical caterpillars, varying in colour from grey to black, many being more or less striped or spotted. When disturbed they curl up in a manner characteristic of the group.

The life histories of the cutworms vary according to the species and locality inhabited. Generally speaking, the eggs are laid in grasses and weeds, and very often the caterpillars have already hatched and are in the ground when it is being prepared for the new crop, and are thus ready to feed upon the young plants as soon as they appear above the surface of the ground. When fully grown the caterpillars pupate in the ground, in compact, earthen cells in which they remain for varying periods before the adult moth emerges.

Fortunately, cutworms may be easily controlled by the use of a poison bran bait prepared from the following formula:—Bran, 24 lb.; Paris green, 1 lb.; water, 3 gallons; salt, 4 oz. Mix the Paris green and bran thoroughly while dry, and then make into a crumbly mash with the water in which the salt has been dissolved.

If cutworms are suspected of being present in the soil prior to sowing or planting, and this may be expected if the land has been only recently turned or has carried a good growth of natural herbage, a precautionary treatment of the area with the bait will prevent considerable loss when the plants germinate or are transplanted.

If it is necessary to treat the seed-beds after the young plants are up, the bait should be scattered lightly, as excessive quantities of the Paris green may injure the young plants. It is considered that 4 lb. of the bait to each 100 square yards is sufficient. Some growers prefer to place the bait in pellets in a regular manner over the surface.

When treating the plants in the field the bait is scattered along the rows, but should not be thrown directly against the stem, as some burning may result. Workers in other tobacco-growing regions consider that 3 lb. per 1,000 plants is sufficient for this application.

In all cases it is desirable to apply the bait as late as possible in the day, so that it will be moist and attractive at night when the caterpillars feed.

(*To be continued.*)

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1932 budding season, trees from which should be available for planting during the 1933 planting season :—

Nurseryman.	Oranges.		Eureka. Lemon.	Marsh. Grape-fruit.	Total.
	Washington Navel.	Valencia.			
L. P. Rosen and Son, Carlingford...	4,000	4,000	1,000	1,000	10,000
T. Adamson, Ermington	1,500	1,500	500	250	3,750
A. T. Eyles, Rydalmere	2,000	1,000	...	...	3,000
H. J. Ferguson, Wyong	...	200	...	...	200

—C. G. SAVAGE, Director of Fruit Culture.

Orchard Notes.

MAY.

C. G. SAVAGE and H. BROADFOOT.

THE harvesting of the late apple crops, preparation for an early start with the pruning and for the planting of deciduous trees, also strawberry planting, are some of the tasks calling for attention any time during May.

Commence the Pruning Early.

Tests carried out by the Department have failed to indicate definitely whether pruning early inclines a tree to break into growth during a mild spell in early winter, but where large areas have to be handled it is generally more economical to get an early start and so give a longer pruning season. It often occurs that pruning is delayed so long that the ploughing has to be put off until it is perhaps too late for best results. Furthermore, late ploughing is likely to clash with spraying operations in the spring.

The chief aim when pruning young trees is to develop a strong well-shaped frame. In the years to come the tree must bear a burden of fruit, and to do this it must be so treated that it will have sturdy limbs. If limbs are allowed to weaken by excessive, unchecked growth, and to commence cropping whilst they are too fragile to bear the weight of fruit, the results may be disastrous. It will be most unsatisfactory and unprofitable to a grower to harvest a good crop of fruit from trees if that crop has been produced at the expense of the well-being of the trees. If young trees are carefully selected and then sturdily built up, the subsequent cropping must be satisfactory. When a good framework has been formed, and if the tree is still growing vigorously, it is usually advisable to allow the tree to remain unpruned for a season; this will induce it to crop.

The characteristics of the tree must, of course, be taken into consideration. For example, peaches bear only on last year's growth, and, unlike the apple and pear trees, do not develop fruit-bearing spurs. In old apple and pear trees these fruit-bearing spurs sometimes need thinning out to prevent their becoming too crowded. Factors which affect the growth and development of trees, such as soil, location, character and influence of stock, manuring, cultivation and spraying, all play their part in deciding the extent and nature of the pruner's operations and prevent any rigid rule being laid down.

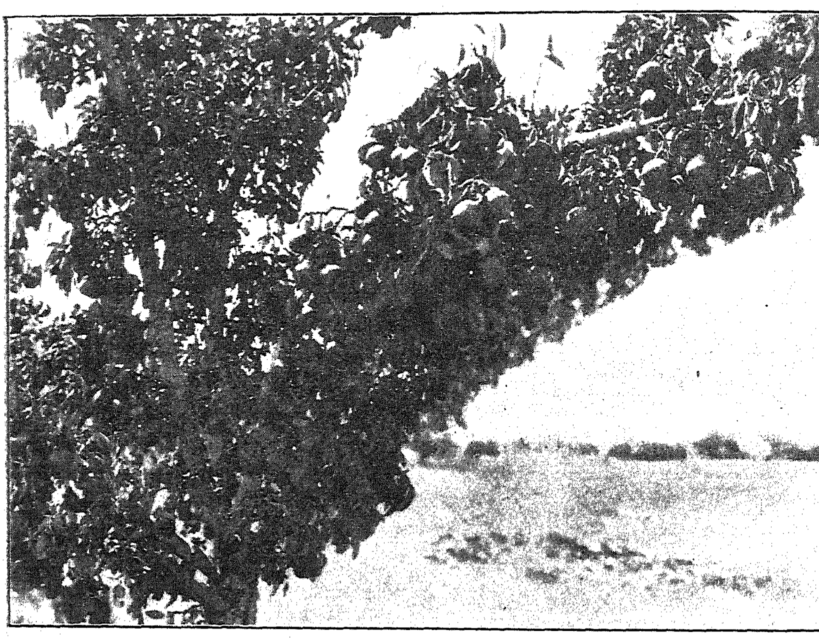
Spur Pruning Benefits Pear Trees.

In Orchard Notes for May, 1932, attention was drawn by Mr. W. W. Cooke, Senior Fruit Instructor at Goulburn, to the fact that fairly strong-growing Williams and Packham's Triumph pear trees had carried satisfactory crops of fruit that season, although thrips had been present in the

blossom in large numbers, whilst adjacent trees, the growth of which was weak or nil, failed to set any fruit.

Similar instances of the advantages of moderate wood-growth have again been noticed this season, whilst the benefits derived from spur pruning of pear trees—where necessary—have been very noticeable, and all varieties of pears so treated, as well as some kinds of apples, showed improvement in the setting and quality of the fruit.

At Parkesbourne, in the orchard of Mr. W. Grunsell, a Marie Louise pear tree which had not produced a half-case of pears per annum for the last five or six years was heavily spur-pruned last winter, and produced a crop of from 5 to 6 bushels of pears this season. Trees of other varieties in Mr. Grunsell's orchard gave similar results.



Showing the Benefits of Spur Pruning.

In another orchard in this district three limbs of an old Winter Nelis pear tree were spur-pruned, fully 75 per cent. of the blossom buds being cut out. These three limbs are carrying a heavy crop of pears, whilst the blossoms on the rest of the tree failed to set. In the accompanying illustration one of the three limbs which were spur-pruned is shown bent down by the weight of fruit. The upright portion of the tree shown was not pruned, and it failed to set any fruit.

Spur-pruning experiments on weak-growing apple trees on which it was considered the blossom buds were too numerous also gave very favourable results. In this case the object was not to help the tree to set more fruit, but by reducing the crop to improve the quality of the fruit produced,

and also to improve the health of the tree, the profuse blossoming of some trees having a weakening effect. It was also expected that this treatment would increase the likelihood of a crop of fruit the following year, and judging by present appearances it seems likely to have this effect.

Prepare for Deciduous Planting.

Land which it is intended to plant to deciduous fruit trees will already have been ploughed and subsoiled, and will now probably only need working with harrows and cultivators to complete its preparation, though a cross-ploughing may be advisable first in some cases. A cloddy surface should be aimed at, so that the final working should be given with a deep-stirring implement that will bring the clods to the top and sift the finer soil particles underneath.

A careful examination should be made of the trees on their arrival from the nursery, and any diseased, insect-infested, or ill-developed specimens rejected. Those selected for planting should be placed in a trench with their roots covered with moist soil, and removed as required for planting out.

The System of Planting.

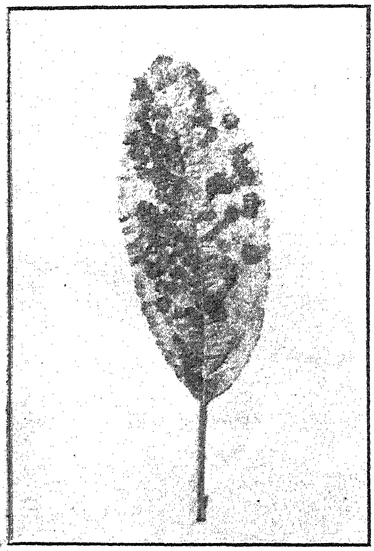
There are two common systems of planting out, viz., the "hexagonal" and the "square." The former has the advantage that it enables working three ways compared with two when the trees are planted on the square, which is sometimes an advantage on hilly country, though in such a case it is wiser to divide the area into blocks according to the slope of the land, and fix the direction of the rows so that the furrows left from ploughing or cultivating will carry the water at an easy grade. On hillsides also, sufficient "surface retaining" drains with an easy grade should be provided before planting, to prevent heavy flows of water washing away the cultivated soil.

More trees may be planted in a given area by the hexagonal than the square system, the distances apart being equal, but it should be remembered that it is the carrying capacity of the land, *i.e.*, the number of trees which it has been found satisfactory to plant to the acre, that is the governing factor on planting. If it is desired to plant seventy-five trees to the acre, the distance apart would be 24 feet on the square, but would be increased to 25 feet 9 inches with the hexagonal system.

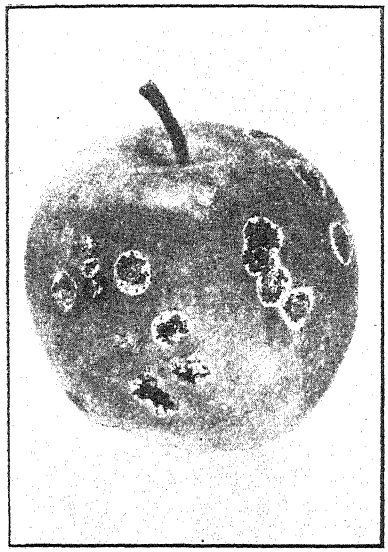
Black Spot Follows Relaxation of Control Measures.

Although the summer has been a very dry one, black spot of apples and pears has been more prevalent this season in southern New South Wales than for many years, if ever, before. Black spot was found in districts in which, up to this season, it had not been previously known. This is probably due to the fact that less spraying for black spot took place last season, the crop of fruit being very light through attacks by thrips. This allowed the leaves of the trees to become badly attacked by spot, resulting

in vast numbers of spores being present in most orchards in the spring. Thus, where spraying was neglected, or only partially carried out, the loss from black spot was very great in the case of susceptible varieties. Climatic conditions were also favourable for spot development, for though useful rain was scarce in many districts, light falls and mists were numerous in the spring. It was most noticeable that where the Department's recommendations were carried out excellent control was obtained, both the



Apple Leaf Affected with Black Spot.



Granny Smith Apple affected with Black Spot.

fruit and the leaves of even those varieties most liable to spot being quite or almost free of disease. The recommendations are:—

Prune out and burn all dead and diseased wood.

Spray as follows:—

1. Bordeaux mixture (6-4-40) at "spur-burst" stage.
2. Lime-sulphur (1 in 14), 26 deg. Baumé, at "pink" stage.
3. Lime-sulphur (1 in 35), 26 deg. Baumé, at "calyx" stage, when the petals are falling, combined with arsenate of lead for codling moth.
4. Lime-sulphur (1 in 35), 26 deg. Baumé, combined with the first, second, and third "cover" sprays of arsenate of lead, if necessary.

Lime-sulphur when combined with arsenate of lead is liable to leave a deposit on the fruit and leaves, which depreciates the market value of the former and appears to have a detrimental effect upon the tree through its action upon the latter. This objection may be overcome by the use of calcium caseinate, used in the proportion of 1 lb. of calcium caseinate to 80 gallons of spray. Calcium caseinate should be mixed by gradually blending it with small quantities of water until it is brought to the consistency of cream. This procedure will obviate difficulty in mixing and the formation of lumps. When combining the solutions, the arsenate of lead

should first be placed in the vat, then the calcium caseinate and finally the lime-sulphur. It is advisable to use the spray as soon as possible after it is prepared, and care should be taken to see that it is kept thoroughly agitated when being applied.

Maintain the vigour of the trees, by the systematic use of fertilisers if necessary.

Watercore of Apples Very Prevalent.

Glassiness or watercore has been very prevalent this season. The condition is due to a physiological disturbance within the apple tree and not to any parasitic organism. It makes its appearance most frequently in wet years, especially if rain occurs at about the time the fruit begins to ripen, and it appears that conditions affecting transpiration are the prime factors inducing it.

Complete control, according to Mr. W. A. Birmingham, Assistant Biologist, appears to be out of the question, owing to climatic factors being involved. The following recommendations may be expected to reduce the amount of watercore:—

(1) Adequate provision should be made for drainage.
(2) Every endeavour should be made to maintain the control of fungus and insect pests, particularly those causing defoliation.
(3) Light pruning should be practised in the case of susceptible varieties.
(4) Where irrigation is practised, the water should be supplied in reasonable quantities. Particular care should be taken just prior to the ripening of the fruit.

Under proper storage conditions, affected fruit may make partial or complete recovery in proportion to the extent that they are watercored. Some varieties, it is claimed, make a better recovery than others, and small apples a better recovery than larger ones. The most desirable storage arrangements are those where coolness, good ventilation and even temperature conditions can be maintained. Instances are on record where badly watercored apples have shown at the end of a few weeks only a trace of the disease if placed in a cool passage, and become quite free if stored at 32 or 34 deg. Fahr. for from three to four months. As soon as watercore is detected in fruit on the trees the crop should be harvested and stored under the conditions mentioned above. Fruit in which the fruit cavities have become filled with liquid should not be stored, however, as fermentation and disintegration of the tissues are likely to occur.

The following varieties have been recorded as susceptible:—Democrat, King David, Lord Suffield, Winter Majetin, Irish Peach, Lord Wolseley, Mobb's Royal, Golden Reinette, Granny Smith, Cox's Orange Pippin, Stewart's Seedling, and Stone Pippin. Granny Smith has not previously been regarded as susceptible, but it has shown signs of the trouble this season.

The three last-named varieties are very liable to watercore.

Other Jobs for May.

Clean Up the Packing Shed.

Before turning to winter work the orchardist should put his packing shed in order. All receptacles, such as cases or bags, that have held apples or pears during the season should be dipped in boiling water for not less than three minutes. Any packing shed appliances that cannot be dipped should be thoroughly searched for any codling grubs concealed therein, and if at all possible the shed should be made moth-proof.

The bandages should still be kept on the trees, as it is not uncommon to find grubs, late in winter, in bandages that have been previously cleaned.

Woolly Aphis.

In nearly all apple districts the woolly aphis parasite, *Aphelinus mali*, keeps the aphids under control, with the result that the pest is now very little in evidence in the autumn. It is, however, sometimes found in an occasional orchard, and where this is the case and the trees are badly infested with this pest a spraying with tobacco wash or nicotine sulphate should be given at the end of the month to clean up the trees. When spraying for woolly aphis use a high pressure to break up the clusters of aphids.

Strawberry Planting.

Though later planting of strawberries than May is now favoured by many growers, this month was previously considered the best time for planting this berry. Provided the winter is not a severe one the plants, when put out in May, become sufficiently established to yield a main crop the first season after planting.

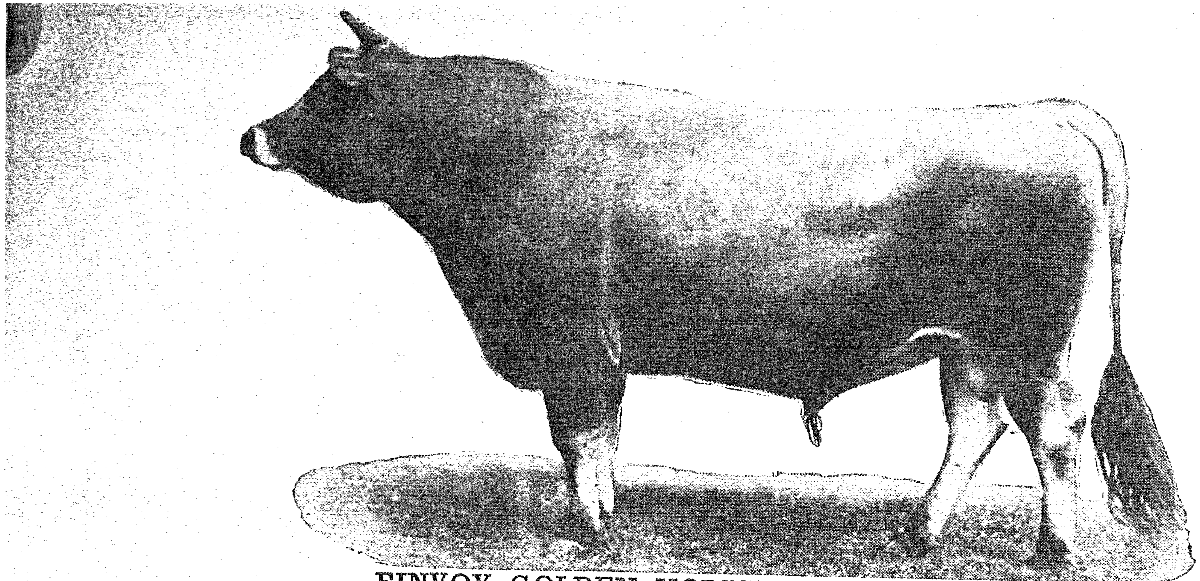
A booklet on strawberry culture can be purchased from the Department, price 7d. posted.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Orange (G. R. Williams)	May 2, 3, 4
Narrabri (D. McR. Fraser)	„ 3, 4
Grafton (L. C. Lawson)	„ 3 to 6
Wellington (A. T. Smith)	„ 9, 10
Moree	„ 10, 11
Maclean (T. B. Notley)	„ 11, 12
Dubbo Diamond Jubilee (F. W. K. Wise.)	„ 16, 17
Casino (E. J. Pollack)	„ 17, 18
Coonamble (Jubilee)	„ 23, 24
Trangie (F. H. Hayles)	„ 30, 31
Warren	June 7, 8
Sydney Sheep Show	„ 22 to 24
Tullamore (W. J. Colville)	July 26
Peak Hill (W. R. L. Crush)	Aug. 1, 2
Trundle (D. Leighton)	„ 8, 9
Condobolin (J. M. Cooney)	„ 15, 16
Gilgandra (G. Christie)	„ 15, 16
Grenfell	„ 22, 23
Bogan Gate (J. T. a'Beckett)	„ 23
Parkes (L. S. Seaborn)	„ 29, 30
Young	Aug. 29 to 31
Lake Cargelligo	„ 30, 31
Gosford	Sept. 1, 2
Forbes (E. A. Austin)	„ 5, 6
Murrumburrah	„ 5, 6
Cowra	„ 12, 13
West Wyalong	„ 12, 13
Barmedman	„ 16
Canowindra	„ 19, 20
Lockhart	„ 21
Quandialla	„ 27
Hillston	„ 27, 28
Berrigan	„ 28
Hay	„ 28, 29
Hall (F.C.T.)	„ 29, 30
Narrandera (J. D. Newth)	Oct. 3, 4
Deniliquin (P. Fagan)	„ 4
Leeton (E. C. Tweedie)	„ 10, 11
Griffith	„ 17, 18
Cootamundra	„ 24, 25



FINVOY GOLDEN NOBLE (Imp. N.Z., Vol. 15).

Departmental herds include the following Stud Bulls :—

Guernsey : HOPEFUL OF WOLLONGBAR (499), Champion, R. A. Show, Sydney, 1928. *Ayrshire :* SCOTTISH PRIDE OF GOWRIE PARK (3797), First and Champion, R. A. Show, Sydney, 1927 ; First and Reserve Champion, R. A. Show, Sydney, 1928. *Milking Shorthorn :* MORNING STAR OF DARBALARA (Vol. 8), Second, R. A. Show, Sydney, 1928. Morning Star is ex Melba 15th of Darbalara, World's champion cow of all breeds—32,522.5 lb. milk, 1,614.1 lb. butter fat in 365 days. *Jersey :* FINVOY GOLDEN NOBLE (imp. N.Z., Vol. 15).

The Department has for sale young bulls from tested dams of the following breeds :—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

Application should be made to—THE UNDER SECRETARY, Department of Agrioulture, SYDNEY

Black Scours in Young Sheep.

TRICHOSTRONGYLOSIS.

GRAHAME EDGAR, B.V.Sc., Veterinary Research Officer.

WHILST it is well known that very serious effects and heavy mortality may occur in young, and even adult, sheep from gross infestation with the "wire-worm," *Haemonchus contortus,* it is not so generally recognised that another type of parasite, a "hair worm" (*Trichostrongylus*), much smaller and hence only demonstrated with some difficulty, may also occasion serious loss, particularly in young sheep.

Whilst it has been found that trichostrongylosis is responsible for severe losses in young sheep in South Africa its exact effects in Australia have been the matter of some doubt. Officers of this Department have recognised *Trichostrongylus* as a serious parasite, but have not attempted to determine the relative effects produced by *Trichostrongylus* and *Haemonchus.* Gordon, working at the McMaster Animal Health Laboratory, following experimental infestation of lambs, concluded that, whilst infestation by *Trichostrongylus* depressed the weight gain, it produced a much less severe complaint clinically than *Haemonchus.*

The outstanding feature of trichostrongylosis is the general unthriftiness of the young sheep concerned. In spite of what may appear to be favourable grazing conditions, the hoggets are under-sized, and show progressive emaciation, culminating in mortality, varying in percentage.

The Parasite Responsible.

Investigations have shown that the losses are the result of severe infestations with one or other species of "hair worms"—*Trichostrongylus* spp. These parasites are minute, hair-like worms, less than half an inch in length, which lie close to, many embedded in, the lining of the small bowel.

A number of species of *Trichostrongylus* have been known for some years to infest sheep in this State, but recent investigations at Glenfield indicate that *Trichostrongylus vitrinus* is the one commonly associated with losses. In one case, however, *Trichostrongylus rugatus* appeared to be responsible. These two parasites have recently been described by Gordon.

As there are a number of different round worm parasites found in the stomach and bowels of sheep, it is not surprising that, in the case of the mortalities referred to, parasites other than *Trichostrongylus* may be found at times. In these cases, however, worms of the genus *Trichostrongylus* have far exceeded in number other worms present. *Nematodirus* has been found on a number of occasions, sometimes in fairly considerable numbers, but *Haemonchus contortus,* the common stomach worm, has commonly been absent.

Distribution.

Whilst this type of worm has been met with chiefly on the slopes and tablelands, investigations have shown that it occurs much more widely, and it has caused losses in the central-west and north-west plains. The plains country, which experiences long, hot summers, has always been regarded as particularly sound grazing country, losses from worms in sheep being generally regarded as a remote possibility. During the spring of 1932, hovewer, trichostrongylosis of young sheep has been severe through much of the country mentioned, the mortalities in some flocks of young sheep being as high as 35 per cent.

Age and Class of Sheep Affected.

On the southern Monaro the greatest trouble is experienced in hoggets five to twelve months old, but in other parts of the State weaners and even sucker lambs, have been lost from this cause. Older sheep running with these do not suffer. Sheep which survive trichostrongylosis during the first eighteen months of their existence do not show evidence of infestation during subsequent years.

Symptoms.

The first symptom noted is that the young sheep, though apparently receiving sufficient nourishment, are not doing well. They are lacking in size and general development. Shortly a number are seen to show "black scours," dark-green, almost black diarrhoea soiling the crutch, hocks and legs. The animals lack vitality and can be easily caught. The lack of condition now changes to actual loss of weight, the animals gradually showing wasting, and, through lack of growth, presenting a stunted appearance.

Apart from the scouring, there is nothing which would suggest to the sheepowner that the trouble is due to dorms. In sheep caught the skin and eyes are bright and of good colour. There is no "bottle jaw," and, until the later stages, no "pot belly."

The outstanding symptoms, therefore, are "black scours" and stunted appearance. The symptoms are brought about by the worms interfering with the digestive system of the animal, and unless the parasites are overcome the affected sheep become progressively weaker, many dying. As the sheep get older, and particularly with treatment, the scouring ceases, but the survivors' lack of size is evident for many months.

Post-mortem Appearances.

In animals which die, the extremely emaciated condition is further revealed upon post-mortem examination of the carcase. There is only a negligible amount of kidney and caul fat and the muscles are poorly developed. There is no increase in the normal amount of fluid in the belly and chest cavities, or around the heart, and in these features trichostrongylosis differs markedly from the appearances brought about by the wire-worm, *Haemonchus contortus*.

Cursory examination of the stomach and small bowel contents conveys the impression that no parasites are present. However, upon closer

scrutiny, especially by the use of a hand lens, and by gently scraping the mucosa, small, red, hair-like worms in very large numbers can be detected.

On days when the sky is overcast the parasites are extremely difficult to detect, but on a bright sunny day they can readily be detected, especially if a hand lens is used.

Varying numbers of *Trichostrongylus* are seen in the abomasum, but the small intestine invariably shows a heavy infestation, the parasites being present in some cases throughout the whole of the first 25 feet of the small intestine. They are most common between 3 and 15 feet from the stomach. A few may be present in the jejunum, but we have not encountered them in the ileum (last portion of the small bowel). Varying degrees of infestation with *Nematodirus filicollis* have been seen in the first 10 feet of the small intestine, and Ostertagia may be seen in the stomach and also in the small intestine. *Haemonchus* may be present in the stomach, but commonly is absent.

Seasonal Influences Bearing upon the Infestation.

For the last three years, New South Wales has had good seasons, and rainfall registrations over the State for this period show that, in districts where trichostryongylosis has occurred, the average annual fall has been exceeded. Still another feature has been the regular nature of the falls during this period. Thus with abundant rains there was considerable growth of feed, and with the lack of any prolonged dry spells during summer, conditions unfavourable for the survival of the parasite have not at any time existed. Small wonder then that sheep became infested in greater and greater numbers until, during 1932 the effects of these parasites were especially serious.

In localities where parasitic troubles are generally unknown, conditions such as those mentioned above have allowed the parasite to become established, particularly where, through non-recognition of the parasite nature of the trouble, drenching was not carried out.

Summary and Conclusions.

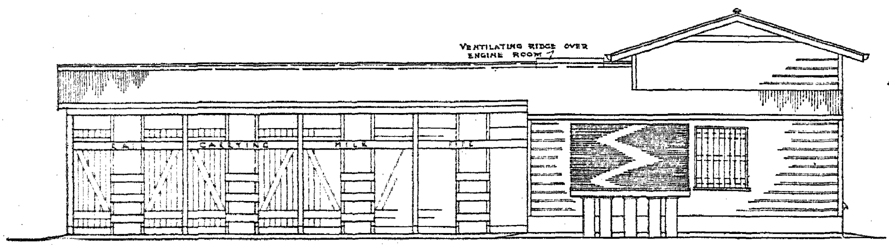
It will be seen from the foregoing that during the last two years sheep-breeders of this State have encountered considerable trouble with their young sheep. This has varied, from inability to fatten the animals, to serious mortality. Affected sheep show stunted growth and "black scours," and investigations show that the condition is due to heavy infestation with *Trichostrongylus,* the parasite commonly responsible being *Trichostrongylus vitrinus.*

Dr. L. O. Howard, Principal Entomologist of the U.S.A. Department of Agriculture, estimates that in 1919 the ravages of insects reduced the value of crops in U.S.A. by £400,000,000. In spite of such huge losses he contends that mankind has not yet learned its lesson. When a particular crisis occurs we often fight very well, and then as conquerors we relapse into muddling along.

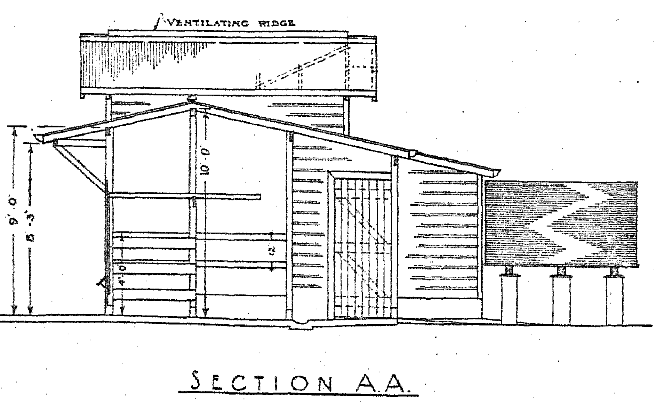
Dairying Notes.

Aspect of Dairy Buildings is All-important.

THE Department was recently asked by the Primary Producers' Union to give consideration to a modification of the requirements of the regulations under the Dairies Supervision Act regarding the construction and location of bails, separator room, and milk and cream storage rooms. Where the separator room was attached to the bails it was suggested that instead of building it according to the accompanying plan, *i.e.*, with the gable roof running in the opposite direction to that of the bails and raised above the level of the latter, it would be cheaper and just as efficient merely to continue the bails' roof, in the same direction and at the same height.



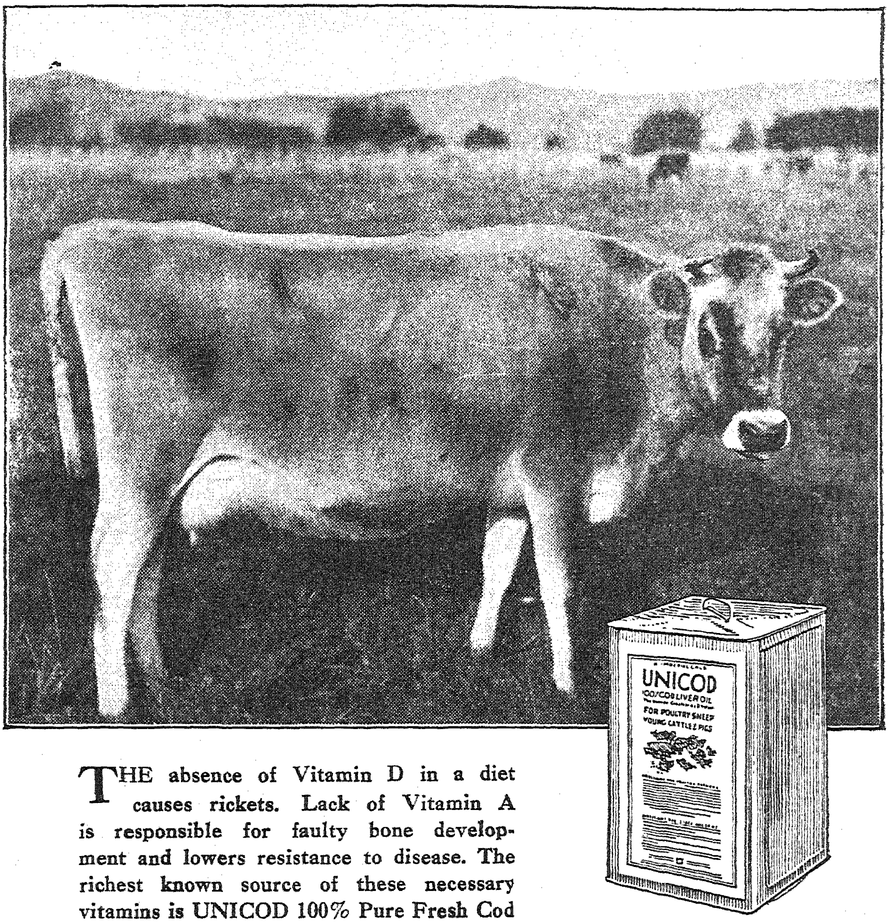
SIDE ELEVATION



SECTION A.A.

Side Elevation and Cross Section of Machine Milking Bails and Separator Room Attached.

The requirements under the regulations (it was pointed out by the Department in reply) are based on sound general principles, and when these are explained to the farmer he is generally convinced that there is very good reason for the regulations being as they are. At any rate, the Central Executive of the Primary Producers' Union expressed satisfaction with the Department's reply, which pointed out that in the location and erection



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of bails the farmer must endeavour to protect himself from the effects of rain, wind, and the afternoon sun in summer months, while, on the coast (where the majority of dairies are situated), he should aim at getting the benefit of the summer north-east wind. Moreover, bad weather (rain and cold driving rain) mostly comes from the south, south-east and south-west, while cold winds without rain come from the west in the winter, and hot winds from the same direction in the summer. Bearing these points in mind, the farmer usually faces the entrance to the bails due north or as near north as possible. This aspect not only gives him the weather protection he desires, but also allows entrance to the bails of the maximum forenoon sun—a very important factor from the point of view of sanitation. The prevailing cool summer wind is from the north-east, and the milkers and stock want to have the utmost benefit from this—another reason for the northerly aspect.

The same reasons as those given above guide the farmer in the erection and location of calf and pig pens and houses, and for these reasons the gables of the bails and pens are best placed to run due east to west.

Opposite Aspect for Separator and Milk and Cream Storage Rooms.

Whereas the bails are protected against cold winds, use is made of these to aerate and cool the separator and milk and cream storage rooms, which, unlike the bails, are completely closed in on all four sides.

In the separator and wash-up rooms, hot and boiling water have to be provided and used freely. This creates steam and warm, humid air. The utmost use of the prevailing cool winds has to be availed of, to create an overhead cross current to get rid of steam and generally to aerate the enclosed spaces. This overhead ventilation can best be obtained through louvres in the gable ends of the separator room when the gable runs due north and south, which is just the opposite to the requirements in regard to bails. Height of walls as well as gable louvres are also needed for ventilation and protection against yard dust.

Optional to Line Walls.

Some doubt exists among dairy farmers as to whether the walls and ceilings of dairy buildings have to be lined.

It is compulsory that ceilings be provided, except in the case of bails. The ceiling must follow the contour of the roof, which, except in the case of bails (gable or flat roof optional) must be of the gable or hip type, flat or skillion roofs being considered too hot in the summer, as they do not allow of proper ventilation. For this latter purpose all ceilings must leave boxed-in apertures for ventilating cowls or be provided with raised ridge capping. Furthermore, the ceiling must be close fitting at its intersection with the walls to prevent dislodged dust from falling into the exposed milk or cream inside the room.

It is optional to line the walls of separator and milk and cream storage rooms. Provided the interior surfaces of the chamfer boards and studs or sawn slabs are dressed smooth, free from knots and treated with two coats of approved limewash or two coats of good oil paint, lining can be dispensed with. If these conditions are not complied with, it will be necessary to line the buildings with fibro-cement, dressed lining boards, flat sheet iron, or other approved material. Where the walls are constructed with the studs on the exterior sides it is only necessary to have the interior surfaces of the chamfer boards dressed smooth and treated with limewash or oil paint as mentioned above. It is recommended that the outside of the studs and walls also receive two coats of oil paint.

Supply Bone Meal and Salt Separately.

A STOCK lick is primarily intended to supply those minerals essential for growth and production which are lacking in the soil, and consequently in the pastures growing thereon. It is absolutely impossible for any animal on a diet poor in essential minerals to make normal growth or to be capable of normal production, whether it be flesh, wool, or milk.

The great bulk of the soils of New South Wales are deficient in phosphorus and calcium, particularly after they have been grazed for long periods. Probably the best means of remedying this soil deficiency is by top-dressing the pastures with fertiliser. Next in importance to top-dressing is the supply of a mineral lick containing adequate amounts of phosphorus and calcium. Such a lick is sterilised bone meal and owners should adopt the practice of supplying pure bone meal to their stock.

Salt, which is also essential, should also be supplied, but in a separate container to the bone meal. The animals themselves will then be able to choose as to the amount of either they will consume, and in this regard be it understood that the animal is a better judge as to what it requires than is man, who endeavours to compound a suitable mixture, often at the expense of the animal and his own pocket. Stock which have been accustomed to being fed a lick containing salt may, for a few days, require to be enticed to partake of the pure bone meal, and this can be accomplished by mixing a small amount of salt with a small amount of bone meal. Whether rock salt or coarse salt is used is immaterial, and in this connection it is of interest to note that frequently small quantities of iodine are present in salt as impurities, and in many cases these small traces of iodine correct any slight iodine deficiency which may exist in the soils.

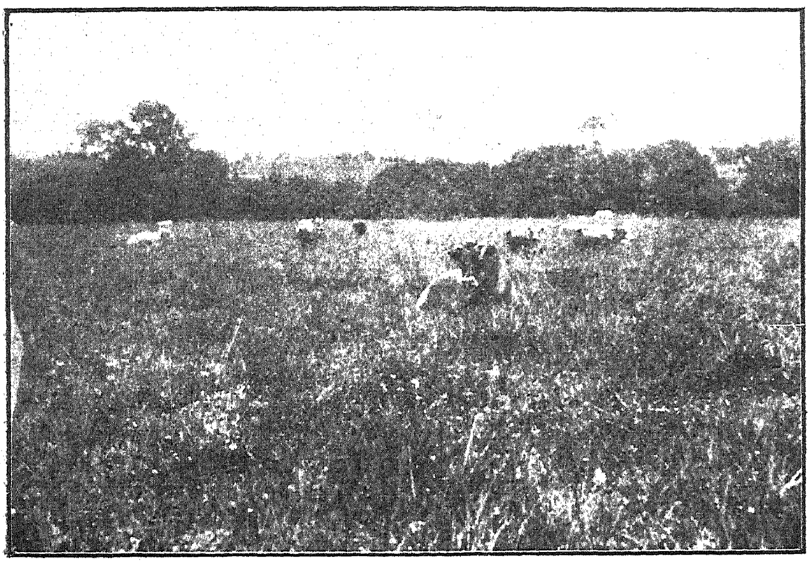
Improve Your Paspalum Pastures.

By Top-dressing.

TOP-DRESSING ploughed paspalum pastures with fertilisers has been found very beneficial, and is also recommended where ploughing is impossible but the use of the paspalum cultivator is practicable. The use of fertilisers, such as superphosphate, stimulates the growth of grasses and legumes, and the amount of mineral matter in the plants is increased, particularly the

elements lime and phosphorus, which are essential for the animal's development. Stock grazed on pastures deficient in these substances invariably become "bone chewers," but by feeding the pasture plants with fertilisers the composition of the feed is considerably improved. Where a marked increase in the lime content of the soil takes place, the percentage of nitrogen in the pasturage also increases.

Stock prefer top-dressed portions of a paddock to unmanured sections, because (1) they obtain more lime and phosphorus (two substances essential to the building up and maintenance of the animal's framework), and (2) the top-dressed pasture is more palatable and nutritious, and contains a greater amount of protein, due, mainly (*a*) to the increased growth of clovers, and (*b*) to the increased percentage of nitrogen present in the pasture as a whole.



Contented Cows in a Good Mixed Pasture.

Therefore, by nourishing the pastures, not only is a greater quantity of feed obtained, but also a considerable increase in the nutritive value of the plants. It has been demonstrated for many years past that by top-dressing pastures the growth of the better class grasses is encouraged, and the development and seed production of clovers are increased. Clovers are the most economical form in which to supply protein to animals, and it is expedient that young growing stock, animals producing and rearing young, and cows in milk, should receive large quantities of this nitrogenous material, which is so essential to their well-being.

Stock grazing on pastures remove from the soil an amount of fertility that corresponds to the quantity of meat or milk produced from the pasturage consumed. To counteract this loss the fertility of the soil must be reimbursed, chiefly through the application of fertilisers.

Autumn is the time recommended for the top-dressing of paspalum pastures. If it is found necessary to force the grass growth at any period of the year, and particularly during the winter months, the use of 1 cwt. sulphate of ammonia per acre is recommended; but in every case a phosphatic fertiliser such as superphosphate should be the basis of pasture top-dressing, using 2 cwt. per acre.

Unploughed paddocks to be top-dressed must first be raked or harrowed to remove dead grass and other rubbish, and the matted crown of the grass should then be torn by the use of suitable grass cultivators or grass harrows. It is useless to apply fertiliser until the matted surface is properly opened up.

By Encouraging Clovers.

The most outstanding plant for sowing in coastal districts, and especially amongst paspalum, is White clover (*Trifolium repens*). In many localities this clover is so plentiful that in a good season dairy stock have to be judiciously grazed on it, otherwise losses may occur through hoven or bloat. There are centres, however, where this species of clover is becoming thinned out of pastures through overstocking, and re-seeding of the area by sowing during autumn and cultivating in 2 to 3 lb. per acre of the best quality certified seed is necessary.

Until recently, the idea that the various perennial forms of Red clover (*Trifolium pratense perenne*) formed little or no seed was generally accepted, but their spread into areas which have not been planted with seed has proved that a fairly liberal amount of seed is formed, especially when the clover is grown under cultivation. During the past few years, the growing of Perennial Red clover on cultivation land and grazing stock on it has been fairly extensively practised in South and Central Coast districts, and it is now quite a common sight to see patches of this clover springing up in paspalum and native grass paddocks. This result is obtained through the cows grazing on the clover areas which are in seed. The seed is evidently not affected by the animals' digestive processes, as it germinates freely in the droppings, which form an excellent medium for rapid growth. This is also a most satisfactory method of spread Subterranean clover in pastures. By turning the stock into a profuse growth of Subterranean clover that is carrying large quantities of seed this valuable legume is soon established among the other pasturage.

Brooks' Seedling Sweet Potatoes Re-named.

Two seedling varieties of sweet potatoes raised by Mr. G. B. Brooks, now Director of Agriculture, Queensland, have been giving considerable promise in New South Wales. These were grown under the names Brooks' Seedling No. 3 and Brooks' Seedling (thought to be No. 29.) In view of their promise in New South Wales it was suggested to Mr. Brooks that he name these varieties. He has now done so, and in future they will be known as Wannop (Brooks' Seedling No. 3) and Ashburn (Brooks' Seedling No. 29).

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date.
Liverpool State Hospital, Liverpool	72	3 May, 1933
Australian Missionary College, Cooranbong	72	5 ,, 1933
W. M. McLean, Five Islands Road, Unanderra	76	6 ,, 1933
A. D. Frater, "Fairview Dairy," Inverell	51	6 ,, 1933
A. H. Pye, Loch Levan, Inverell	47	7 ,, 1933
W. Newcomb, "Minnamurra," Inverell	72	7 ,, 1933
Rydalmere Mental Hospital	77	7 ,, 1933
Miss Brennan, Arankamp, Bowral	17	8 ,, 1933
Koyong School, Moss Vale	3	11 ,, 1933
Tudor House School, Moss Vale	21	13 ,, 1933
St. Joseph's Girls Orphanage, Kenmore	11	13 ,, 1933
St. Joseph's Convent, Reynold-street, Goulburn	3	14 ,, 1933
St. Michael's Novitiate, Goulburn	4	14 ,, 1933
Marion Hill Convent of Mercy, Goulburn	47	15 ,, 1933
Newington State Hospital and Home	100	17 ,, 1933
G. A. Parish, Jerseyland, Berry	93	21 ,, 1933
Riverina Welfare Farm, Yanco	89	24 ,, 1933
Department of Education, Yanco Agricultural High School	39	24 ,, 1933
Lunacy Department, Kenmore Mental Hospital	80	27 ,, 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 June, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	226	2 ,, 1933
W. Hammond, Bellingen	77	16 ,, 1933
Hurlstone Agricultural High School, Glenfield	44	22 ,, 1933
E. C. Nicholson, Jillamatong, Corowa	180	23 ,, 1933
St. John's College, Woodlawn, Lismore	47	23 ,, 1933
Grafton Experiment Farm	271	14 July, 1933
P. Ubrihien, Corridgeree, Bega	123	15 ,, 1933
William Thompson Masonic School, Baulkham Hills	37	20 ,, 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 ,, 1933
G. V. Ralston, "Porphyry," Seaham	98	21 ,, 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook	37	17 Aug., 1933
A. L. Logue, Thornboro, Muswellbrook	36	17 ,, 1933
E. W. Flower, Binna Burra	56	18 ,, 1933
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	43	25 ,, 1933
Sacred Heart Convent, Bowral	10	26 ,, 1933
Lunacy Department, Parramatta Mental Hospital	12	1 Sept., 1933
Department of Education, Gosford Farm Homes	38	2 ,, 1933
James McCormack, Tumut	98	9 ,, 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1933
G. Powell and Sons, "Loch Lomond," Armidale	22	26 ,, 1933
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1933
E. E. McMullen, Springnook, Holbrook	31	3 Nov., 1933
W. R. Boughton, Holbrook	33	3 ,, 1933
C. Maynard, Holbrook	12	3 ,, 1933
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1933
Stace Bros., Taylor-street, Armidale	26	1 Dec., 1933
J. L. W. Barton, Wallerawang	20	1 ,, 1933
Department of Education, Brush Farm, Eastwood	8	3 ,, 1933
Lunacy Department, Morisset Mental Hospital	29	7 ,, 1933
W. W. Martin, "Narooma," Urana Road, Wagga	150	14 ,, 1933
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1933
E. E. Winder, Wybong Road, Muswellbrook	40	22 ,, 1933
C. J. Parbery, Allawah, Bega	112	8 Jan., 1934
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay ...	8	9 ,, 1934
G. H. Hooper, Oak Hill, Bethungra	10	19 ,, 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	81	22 ,, 1934
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	13	27 ,, 1934
J. B. Burtenshaw, "Sunnyside," Inverell	42	27 ,, 1934
Parker Bros., Hampton Court Dairy, Inverell	82	27 ,, 1934
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1934
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1934
W. K. Frizell, Rosenstein Dairy, Inverell...	37	2 ,, 1934
W. Pigg, Redlands Dairy, Inverell	27	2 ,, 1934
A. N. de Fraine, Happy Valley Dairy, Inverell	28	3 ,, 1934
G. L. Genge, "Easton," Armidale	39	7 ,, 1934
J. Davies, Puen Buen, Scone (Jerseys)	191	9 ,, 1934
Forster & Sons, Abington, Armidale	189	12 ,, 1934
A. B. Finney, Fox Ground, Gerringong	33	17 ,, 1934

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
Lidcombe State Hospital and Home	153	20 Feb., 1934
Lunacy Dept., Gladesville Mental Hospital	34	22 ,, 1934
W. J. Miller, 199 Mann Street, Armidale	7	6 Mar., 1934
New England Girls' Grammar School, Armidale...	41	8 ,, 1934
F. C. Butler, Yarranung, Bega	122	24 ,, 1934
G. W. Young, "Boorganna," via Wingham	39	30 ,, 1934
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 ,, 1934
St. Patrick's College, Goulburn	8	21 Sept., 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 ,, 1934
Wagga Experiment Farm (Jerseys)	53	25 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone	92	9 Nov., 1934
Wolaroi College, Orange	11	10 ,, 1934
Wollongbar Experiment Farm, Lismore (Guernseys)	123	11 Jan., 1935
George Rose, Aylmerton	2	21 Feb., 1935
Mittagong Farm Homes	36	22 ,, 1935
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	18	23 ,, 1935
T. H. Maples, Racecourse Farm, Bega	48	2 Mar., 1935
P. M. Burtenshaw, Killean, Inverell	63	18 ,, 1935
J. P. McQuillan, Bethungra Hotel, Bethungra	25	4 April, 1935

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—MAX HENRY, Chief Veterinary Surgeon.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free, and unless otherwise declared this certification remains in force until the date shown:—

Owner and Address.	Number in herd.	Expiry date.
Martin Bros., "Narooma," Urana Road, Wagga Wagga	86	28 Feb., 1934
Cann, H. J., The Gap, Alstonville ...	...	31 Mar., 1934
Sweeney, W., The Rivers, Canowindra	169	31 ,, 1934
White, F. J. and Sons, Bald Blair, Guyra	238	31 ,, 1934

—MAX HENRY, Chief Veterinary Surgeon.

INFECTIOUS DISEASES REPORTED IN MARCH.

THE following outbreaks of the more important infectious diseases were reported during the month of March, 1933:—

Anthrax	Nil.
Blackleg	5
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	1
Swine fever	Nil.
Contagious pneumonia	1
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

Egg-laying Tests at Hawkesbury Agricultural College.

(Under the Supervision of the Poultry Expert.)

Thirty-first Year's Results, 1932–33.

F. H. HARVEY, Organising Secretary.

The thirty-first egg-laying competition at Hawkesbury Agricultural College commenced on 1st April, 1932, and terminated on 23rd March, 1933, a period of 357 days. The interval between 23rd and 31st March makes it possible to remove the birds from the pens and provide for the accommodation of entrants for the next test.

The competition was controlled by a committee of management, comprising four officers of the Department of Agriculture and three competitors' representatives, namely, the College Principal (Mr. E. A. Southee), Messrs. E. Hadlington (Poultry Expert, Department of Agriculture), C. Lawrence (Poultry Instructor, Hawkesbury Agricultural College), C. Judson D. D. Kenway, and L. A. Ellis (competitors' representatives), and F. H. Harvey (Department of Agriculture), Organising Secretary.

Scope of the Competition.

The competition embraced two sections, was limited to pullets between seven and twelve months old on 1st April, 1932, and pens were allotted as follows :—

Section A. (Light Breeds).	Groups.	Birds.	*Section B.* (Heavy Breeds).	Groups.	Birds.
White Leghorns	61	366	Black Orpingtons ...	21	126
Minorcas	1	6	Langshans	5	30
			Rhode Island Reds ...	2	12

Weight of Eggs.

For this competition a new regulation was adopted in regard to the weight of eggs, which provided that the weight should be based on the average of seven eggs laid successively between 1st and 31st July, except that the period was extended to 15th August in the case of birds which had not laid seven eggs during July.

In previous years weighing of eggs was carried out during June, and was terminated as soon as the eggs of a bird attained 24 oz. per dozen, except that birds which had not laid during June were allowed until 1st August to attain the standard weight. The disqualifications in 1931–32 were twelve individuals and one group in heavy breeds and eleven individuals and one group in light breeds, whereas for 1932–33 the disqualifications were twenty-seven individuals and one group in heavy breeds and fifty-eight individuals and one group in light breeds, as follows:—

Disqualified from Individual Prizes.

Light Breeds.—H. L. Abrook (No. 177), F. M. Bailey (No. 189). P. Bennett (No. 200), Bide-a-Wee Poultry Farm (Nos. 206, 209, 210), A. Biden (No. 215), J. Bradford and Son (No. 220), R. G. Christie and Son (Nos. 224, 225), B. Clarke (Nos. 235, 237), K. G. Cobcroft (Nos. 245, 246), J. Cornwell (Nos. 247, 248, 250), S. E. Daley (No. 255), R. B. Dent (No. 261), H. A. Duncan (No. 282), L. A. Ellis (No. 286), S. J. Evans and Son (No. 293), J. L. Flew (No. 298), K. H. Harris (Nos. 322, 324), J. A. Hunt (Nos. 339, 342), I. Lowery (No. 364), Mrs. F. McCallum (No. 369), T. McDonald (No. 377), G. N. Mann (No. 384), F. B. Mullens (Nos. 400, 402), H. R. Nelson (No. 414), J. Rayner (Nos. 437, 438), W. H. Rogers (No. 442), W. J. Scarboro (No. 456), Success Poultry Farm (Nos. 457, 459), Sunrise Poultry Farm (No. 467), R. Thoroughgood (No. 470), V. C. Tunnicliff (Nos. 475, 476, 477, 479), F. T. Turner (Nos. 481, 483), J. T. Webb (No. 494), A. A. Wesley (Nos. 501, 502, 504), A. R. Wheatley (Nos. 507, 510), R. Whitelaw, jun. (No. 511), G. T. Whittaker (No. 521), W. I. Williams (Nos. 525, 527).

Heavy Breeds.—R. L. Bray (Nos. 1, 3, 4, 5), Markwell and Son (Nos. 11, 12), Mrs. V. E. Cox (No. 20), G. E. Holmes (Nos. 41, 42), D. D. Kenway (No. 57), S. Lidden (Nos. 61, 62, 66), Mrs. C. E. Madrers (Nos. 69, 71), A. Sinclair (No. 87), J. W. Smiles (No. 95), H. Taylor (Nos. 99, 102), W. W. Tennent (No. 105), A. Thompson (Nos. 109, 111), M. and H. Williamson (No. 126), W. A. Williams (No. 155), C. E. Messervy (No. 162), J. J. Wilson (Nos. 163, 165, 168).

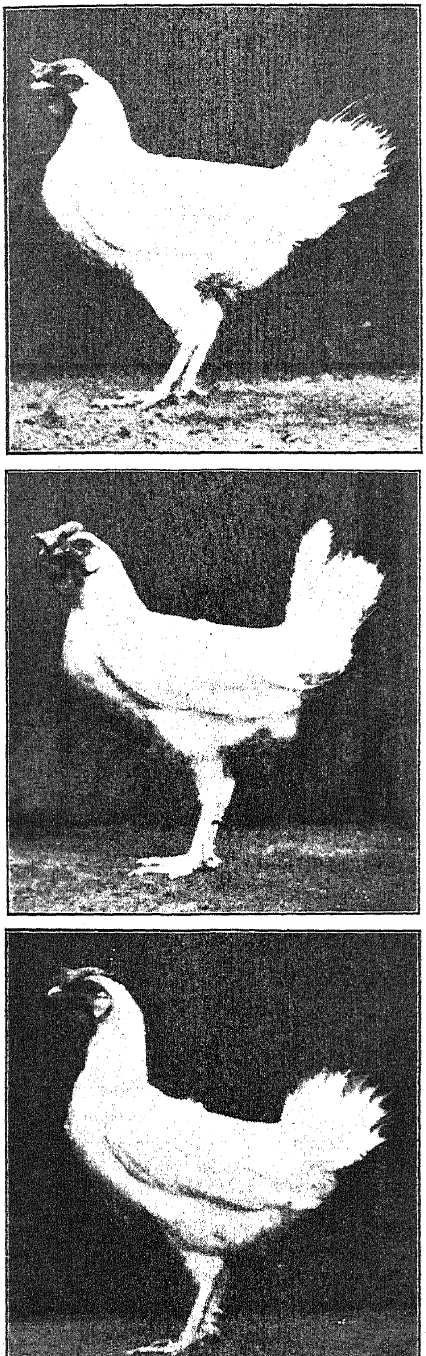
Disqualified from Group Prizes.

Light Breeds.—A. A. Wesley.
Heavy Breeds.—R. L. Bray.

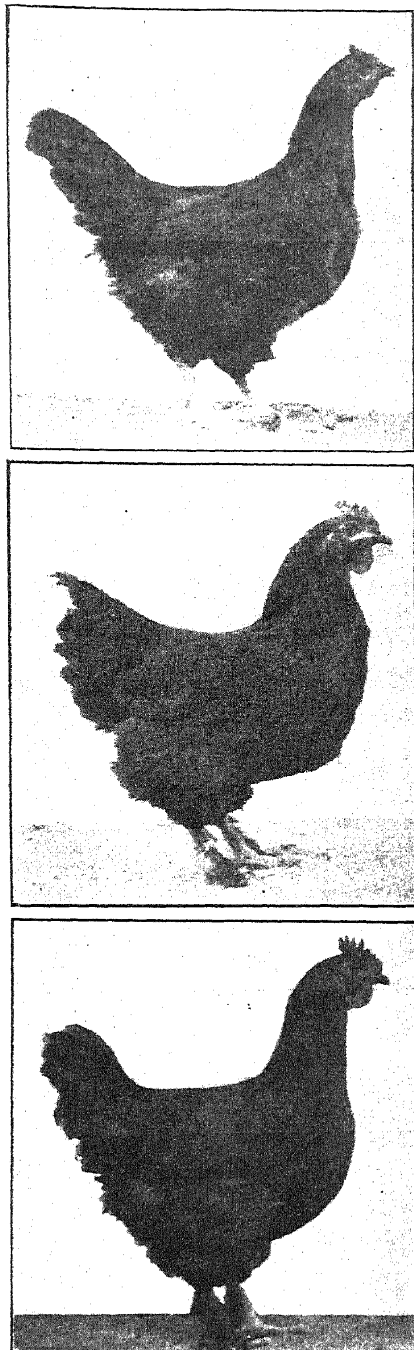
The Financial Aspect.

The quantities of food consumed by the 540 birds were as follows:—

Wheat	344 bushels	20 lb.	Salt	318 lb.
Maize	185 ,,	4 ,,	Shell grit	23 cwt.
Pollard	728 ,,	6 ,,	Green feed	81 cwt.
Bran	364 ,,	3 ,,	Epsom salts... ...	50 lb.
Meat meal	10 cwt.	26 ,,		



Birds from Mr. F. T. Wimble's Entry.
This group laid the greatest number of eggs in the Light Breeds Section.



Three of Mr. F. C. Nicholls' Langshans.
Winners of the Grand Championship and the Golden Egg in 1933.
This group also laid the greatest number of eggs.

The cost of the foodstuffs (including freight and cartage), on the basis of ruling Sydney market prices, was £188 8s., equal to 7s. per head.

The value of eggs laid in the competition, calculated at Sydney ruling market prices for new laid eggs, less the usual pool contribution, freight and commission charges, was equal to an average net price of 1s. per dozen.

The Monthly Laying.

Month.	Section A (Light Breeds).		Section B (Heavy Breeds).		Total.
	Total for 342 hens.	Average per hen.	Total for 168 hens.	Average per hen.	
April, 1932	3,756	10·1	2,287	13·6	6,043
May "	5,120	13·8	3,151	18·8	8,271
June "	5,425	14·6	3,099	18·6	8,524
July "	6,330	17·0	3,278	19·5	9,608
August "	7,325	19·7	3,519	20·9	10,844
September "	7,727	20·7	3,502	20·8	11,229
October "	8,041	21·6	3,322	19·7	11,363
November "	7,592	20·5	2,881	17·2	10,473
December "	6,814	18·3	2,535	15·1	9,349
January 1933	6,126	16·5	2,243	13·4	8,369
February "	5,072	13·3	2,023	12·0	7,095
March "	3,345	9·1	1,440	8·6	4,785
Year 1932–33 ...	72,673	195·2	33,280	198·2	105,963

Averages of Breeds.

No. of Birds.	Breed.	Eggs per Hen.	Weight of Eggs per Dozen.	Value per Hen.
	Light Breeds.			
			oz.	£ s. d.
6	Minorcas	167	25·1	0 15 1
366	White Leghorns	192	25·1	0 15 8
	Heavy Breeds.			
126	Black Orpingtons	197	25·1	0 16 5
30	Langshans	199	25·2	0 16 9
12	Rhode Island Reds ...	197	25·1	0 15 5

Monthly Laying of Individual Prize Winners.

The following table shows the monthly laying of winners of the individual prizes for highest scores:—

Owner.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Total.
	Heavy Breeds.												
A. Greentree	22	24	18	22	29	28	30	28	27	24	25	17	294
Mrs. C. E. Madrers	22	25	20	25	25	27	27	25	25	27	26	18	292
C. W. Gee	22	22	28	28	28	28	28	27	25	20	21	9	286
Markwell & Son	17	23	20	23	24	29	27	30	28	25	23	15	284
	Light Breeds.												
I. Lowery	20	25	24	23	26	26	29	23	25	25	21	12	279
P. Bennett..	18	22	21	23	25	27	30	28	23	24	21	17	279
H. J. Rose..	21	24	24	25	23	26	25	25	24	24	21	16	278
F. T. Wimble	23	27	20	26	29	25	22	26	24	20	20	15	277

Weights of Winning Birds.

The following are the weights at the beginning and the end of the competition of the birds laying the greatest number of eggs:—

		Weight at April, 1932.		Weight at March, 1933.	
Groups.		lb.	oz.	lb.	oz.
Heavy Breeds—	133	4	12	5	8
	134	5	0	4	6
	135	5	12	5	10
F. C. Nicholls' Langshams, Nos. ...	136	5	2	5	4
	137	5	2	7	0
	138	5	4	6	2
Light Breeds—	529	3	14	3	12
	530	4	0	5	0
F. T. Wimble's White Leghorns, Nos....	531	4	4	5	0
	532	3	12	4	0
	533	3	14	3	8
	534	3	12	3	8
Individual Hens.					
A. H. Greentree's Black Orpington, No. 34 ...		5	0	5	14
I. Lowery's White Leghorn, No. 362		3	12	4	4

Mortality and Disease.

The casualties due to deaths and sickness totalled forty-eight, as compared with forty-four in the previous year.

Particulars of the casualties in the different sections in the two years are as follows:—

	1931-32.		1932-33.	
	Light Breeds.	Heavy Breeds.	Light Breeds.	Heavy Breeds.
Birds replaced	10	3	10	8
Birds not replaced	17	14	17	13

Annual Competition.

Full details of the financial and other results since the inception of the competition are given in the following comparative table:—

		No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st	...	38	1,113	459	137	130	1/1	15/6	6/-	9/6
2nd	...	70	1,308	666	160	163	1/3¾	17/9	5/9¾	12/-
3rd	...	100	1,224	532	154	152	1/-	12/9	4/5½	8/3
4th	...	100	1,411	635	168	166	-/11½	13/3	5/3½	8/-
5th	...	100	1,481	721	162	171	1/0½	14/10	5/10	9/-
6th	...	60	1,474	665	161	173	1/2¼	17/2	7/-	10/2
7th	...	50	1,379	656	159	180	1/3¼	19/2	7/9½	11/4
8th	...	60	1,394	739	158	181	1/5¼	21/9	6/9	15/-
9th	...	40	1,321	658	151	168	1/2	16/3½	6/5½	10/2
10th	...	50	1,389	687	146	184	1/2½	18/5½	6/1½	12/4
11th	...	50	1,461	603	156	178	1/3½	19/4¼	7/3½	12/0¾
12th	...	50	1,360	724	152	177	1/2½	17/7	5/9	11/10
13th	...	63	1,541	705	162	181	1/2	17/8½	6/9½	10/11
14th	...	70	1,449	506	165	192	1/4½	22/2	7/7	14/7
15th	A	40	1,526	924	162	216	1/3¾	28/8¾	6/10	16/10¾
	B	30	1,479	749	165	192	1/3¾	21/7½	6/10	14/9½
	Total	70	......	...	...	206	1/3¾	25/8	6/10	18/10
16th	A	40	1,525	923	157	209	1/4	21/9¾	7/8	14/1¾
	B	30	1,613	931	170	202	1/4	21/2	7/8	13/6
	Total	70	......	...	...	206	1/4	21/6	7/8	13/10
17th	A	40	1,448	860	153	199	1/5½	22/0½	7/10	14/2½
	B	30	1,517	815	151	189	1/5½	21/11¼	7/10	14/1¼
	Total	70	......	...	...	195	1/5½	22/-	7/10	14/2
18th	A	30	1,438	988	148	203	1/10	28/10	9/3	19/7
	B	50	1,428	745	151	190	1/10	28/1	9/3	18/10
	C	3	1,304	977	138	195	1/10	27/8	9/3	18/5
	D	7	1,336	955	150	191	1/10	28/5	9/3	19/2
	Total	90	......	...	...	195	1/10	28/4	9/3	19/1
19th	A	33	1,516	996	167	206	2/2	37/11	12/8	25/3
	B	47	1,488	955	168	204	2/2	37/11	12/8	25/3
	C	5	1,425	944	148	195	2/2	36/-	12/8	23/4
	D	5	1,298	1,020	150	193	2/2	35/9	12/8	23/1
	Total	90	......	...	...	204	2/2	37/8	12/8	25/-
20th	A	45	1,480	881	157	196	1/11	30/10	11/9	19/1
	B	35	1,457	696	160	192	1/11	31/2	11/9	19/5
	C	5	1,092	885	144	168	1/11	24/7	11/9	12/10
	D	5	1,370	1,092	147	197	1/11	33/5	11/9	21/8
	Total	90	......	...	...	193	1/11	30/8	11/9	18/11
21st	A	50	1,425	646	164	195	1/9	28/5	10/10	17/7
	B	30	1,417	720	164	188	1/9	27/5	10/10	16/7
	C	5	1,220	864	149	176	1/9	25/8	10/10	14/10
	D	5	1,212	931	144	187	1/9	27/3	10/10	16/5
	Total	90	......	...	...	191	1/9	27/10	10/10	17/-

EXPLANATORY NOTE.—A, Open Light Breeds; B, Open Heavy Breeds; C, Standard Light Breeds; D, Standard Heavy Breeds.

Annual Competition—*continued.*

		No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
22nd	A	50	1,508	942	161	210	1/6	26/3	9/9	16/6
	B	30	1,600	871	164	203	1/6	26/3	9/9	16/6
	C	5	1,307	692	142	170	1/6	21/1	9/9	11/4
	D	5	1,430	1,052	152	205	1/6	26/9	9/9	17/-
	Total	90	......	...	...	205	1/6	25/11	9/9	16/2
23rd	A	57	1,470	961	160	212	1/8	28/7	9/11	18/8
	B	23	1,558	1,006	164	211	1/8	29/2	9/11	19/3
	C	5	1,291	950	146	180	1/8	23/5	9/11	13/6
	D	5	1,308	1,049	159	192	1/8	27/5	9/11	17/6
	Total	90	......	...	...	209	1/8	28/3	9/11	18/4
24th	A	50	1,444	803	158	206	1/6	26/5	10/-	16/5
	B	30	1,466	916	171	199	1/6	26/4	10/-	16/4
	C	5	1,248	881	136	187	1/6	25/-	10/-	15/-
	D	5	1,331	777	151	186	1/6	24/7	10/-	14/7
	Total	90	......	...	...	201	1/6	26/2	10/-	16/2
25th	A	51	1,531	797	162	209	1/8½	29/4	11/-	18/4
	B	29	1,519	753	161	204	1/8½	29/2	11/-	18/2
	C	5	1,319	1,092	147	173	1/8½	23/8	11/-	12/8
	D	5	1,326	842	155	203	1/8½	28/9	11/-	17/9
	Total	90	......	...	...	205	1/8½	28/11	11/-	17/4
26th	A	50	1,505	885	162	205	1/10	30/9	9/7	21/2
	B	30	1,487	1,005	165	207	1/10	31/11	9/7	22/4
	C	5	1,234	790	138	168	1/10	24/1	9/7	14/6
	D	5	1,339	1,029	149	192	1/10	30/-	9/7	20/5
	Total	90	......	...	...	203	1/10	30/9	9/7	21/2
27th	A	55	1,531	868	173	201	1/9½	30/2	8/7	21/7
	B	25	1,386	954	163	201	1/9½	30/11	8/7	22/4
	C	5	1,302	914	147	177	1/9½	26/6	8/7	17/11
	D	5	1,259	883	155	176	1/9½	26/1	8/7	17/6
	Total	90	......	...	...	198	1/9½	29/11	8/7	21/4
28th	A	55	1,496	891	161	206	1/6	25/1	9/10	15/3
	B	25	1,544	931	165	212	1/6	26/11	9/10	17/1
	C	5	1,319	1,190	151	211	1/6	25/11	9/10	16/1
	D	5	1,239	968	160	196	1/6	23/10	9/10	14/0
	Total	90	......	...	...	207	1/6	25/7	9/10	15/9
29th	A	55	1,520	790	158	202	1/3½	20/5	7/3	13/2
	B	25	1,443	925	167	198	1/3½	21/6	7/3	14/3
	C	6	1,280	1,001	146	192	1/3½	19/5	7/3	12/2
	D	4	1,260	1,099	147	198	1/3½	20/8	7/3	13/5
	Total	90	......	...	...	200	1/3½	21/2	7/3	13/11
30th	A	57	1,506	998	156	212	1/0½	17/11	5/9	12/2
	B	33	1,543	762	166	199	1/0½	17/4	5/9	11/7
	Total	90	......	...	...	207	1/0½	17/8	5/9	11/11
31st	A	62	1,447	798	157	192	1/-	15/6	7/-	8/6
	B	28	1,439	756	161	197	1/-	16/4	7/-	9/4
	Total	90	......	...	...	196	1/-	15/11	7/-	8/11

Explanatory Note.—A, Open Light Breeds; B, Open Heavy Breeds; C, Standard Light Breeds; D, Standard Heavy Breeds.

PRIZE LIST.*

* For all prizes it was required that individual birds lay eggs not less than 2 oz. in weight.

Grand Champion Prize (Value, £10 10s.).

For group of six birds (without replacement) laying eggs of greatest market value.—F. C. Nicholls (Langshans), market value, £6 1s. 8d.

Golden Egg of 1933 (Value, £25).

Donated by the Metropolitan Meat Industry Board for groups of six birds completing the competition; points to be awarded for number, quality and market value of eggs, also standard quality of birds.—F. C. Nicholls (Langshans).

Special Prizes.

Golden Egg Consolation (Value £10 10s.).—Donated by Metropolitan Meat Industry Board for leading group in the division opposite to that gaining the "Golden Egg," judged on the same scale of points.—C. A. Clark and Son (White Leghorns).

Judson and Wimbleford.—Special prizes of £3 3s. each (donated by Messrs. C. Judson and Son and F. T. Wimble) for heavy and light breeds respectively (their own entries to be ineligible), for groups laying a minimum of 1,350 eggs, and scoring the most points on the following scale:—Each bird laying 250 eggs or over, 3 points; each bird laying 240-249 eggs or over, 2 points; each bird laying 225-239 eggs or over, 1 point.—*Heavy Breeds.*—F. C. Nicholls (Langshans), 12 points. *Light Breeds.*—No award, Mr. Wimble's group only meeting requirements.

The Wimbleford Thousand (first prize £2 2s., second £1 1s.) donated by Mr. F. T. Wimble for the first and second groups of White Leghorns to lay 1,000 eggs (his own entry to be ineligible).—Morgan and Williams, 21st December, £2 2s.; A. C. Witten, 27th December, £1 1s.

Hadlington Commemoration Medal (donated by Mr. W. H. Paine to commemorate the services of Mr. James Hadlington, late Government Poultry Expert).—To be awarded on points scored for type and breed characteristics, weight of birds and weight of eggs, with minimum score of 1,100.—C. A. Clark and Son (White Leghorns).

"Poultry" Newspaper Special, value £3 3s. (donated by "Poultry" Newspaper) for the individual hen which first lays 200 eggs during the competition.—C. W. Gee (Black Orpington), 17th November.

The Producers' Co-operative Distributing Society, value £2 2s. (donated by the Society), for individual hen laying greatest score without a break.—C. Judson and Son. The bird laid 59 eggs from 4th August to 3rd October.

"Alshel" Prize (donated by Marine Shell Products Ltd., and awarded for the group laying greatest number of eggs, consistent with quality, with a minimum score of 1,100 eggs, all members of the group to lay eggs of 25 oz. to 28 oz. weight).—H. Magull, Black Orpingtons, 1,345 eggs; individual average weights, 25 oz., 25 oz., 26 oz., 25·6 oz., 25 oz., 25 oz.

Quality Prizes.

For selected groups, which conform most closely to standard type. The prizes are awarded according to the number of eggs laid subject to a minimum score of 1,200 eggs:—

Heavy Breeds.—F. C. Nicholls (Langshans), 1,439 eggs, £5; A. Greentree (Black Orpingtons), 1,404 eggs, £2 10s.

Light Breeds.—C. A. Clark and Son (White Leghorns), 1,218 eggs, £5; F. G. Lombe (White Leghorns), 1,059 eggs, £2 10s.

Highest Group Scores.

Heavy Breeds.—F. C. Nicholls (Langshans), 1,439 eggs, £3; A. Greentree (Black Orpingtons), 1,404 eggs, £2 10s.; H. Magull (Black Orpingtons), 1,364 eggs, £2; C. W. Gee (Black Orpingtons), 1,336 eggs, £1 10s.; C. E. Messervy (Rhode Island Reds), 1,268 eggs, £1.

Light Breeds.—F. T. Wimble (White Leghorns), 1,447 eggs, £3; H. J. Rose (White Leghorns), 1,332 eggs, £2 10s.; Morgan and Williams (White Leghorns), 1,300 eggs, £2; A. C. Witten (White Leghorns), 1,269 eggs, £1 10s.; W. C. Hardy (White Leghorns), 1,221 eggs, £1.

HIGHEST INDIVIDUAL SCORES.

Heavy Breeds.—A. Greentree (Black Orpington), 294 eggs, £2 10s.; Mrs. C. E. Madrers (Black Orpington), 292 eggs, £2; C. W. Gee (Black Orpington), 286 eggs, £1 10s.; Markwell and Son (Black Orpington), 284 eggs, £1.

Light Breeds.—I. Lowery (White Leghorn), 279 eggs, £2 10s.*; P. Bennett (White Leghorn), 279 eggs, £2*; H. J. Rose (White Leghorn), 278 eggs, £1 10s.; F. T. Wimble White Leghorn), 277 eggs, £1.

* Tie, decided by market value of eggs, according to regulations.

QUARTERLY (GROUP) PRIZES.

Winter Test (1st April to 30th June).

Heavy Breeds.—F. C. Nicholls, 382 eggs, £2; C. W. Gee, 364 eggs, £1 10s.
Light Breeds.—F. T. Wimble, 343 eggs, £2; A. C. Witten, 295 eggs, £1 10s.

Spring Test (1st July to 30th September).

Heavy Breeds.—C. Judson and Son, 431 eggs, £1 10s.; F. C. Nicholls, 424 eggs, £1.
Light Breeds.—F. T. Wimble, 434 eggs, £1 10s.; Morgan and Williams, 408 eggs, £1.

Summer Test (1st October to 31st December).

Heavy Breeds.—C. E. Messervy, 447 eggs, £1 10s.; A. Greentree, 420 eggs, £1.
Light Breeds.—K. R. Slade, 424 eggs, £1 10s.; C. C. Norman, 413 eggs, £1.

Autumn Test (1st January to 23rd March).

Heavy Breeds.—C. E. Messervy, 333 eggs, £2; F. C. Nicholls, 293 eggs, £1 10s.
Light Breeds.—H. J. Rose, 324 eggs, £2; F. A. Bailey, 292 eggs, £1 10s.

Individual and Group Egg Yields.

EGG-YIELD OF EACH BIRD AND GROUP IN THE THIRTY-FIRST ANNUAL COMPETITION.

Owner and Breed.	Individual Score.						Totals of Groups.	Weight of Eggs per dozen.	Market Value.		
Heavy Breeds.											
								oz.	£	s.	d.
F. C. Nicholls: Langshans ...	154	250	277	283	222	253	1,439	25·1	6	1	8
A. Greentree: Black Orpingtons ...	207	270	209	294	*169	255	1,404	25·6	5	14	2
J. W Smiles: Black Orpingtons ...	239	267	273	*166	‡290	168	‡1,392	25·2	5	17	6
H. Magull: Black Orpingtons ...	261	236	198	226	246	197	1,364	25·3	5	15	2
C. W. Gee: Black Orpingtons ...	276	253	68	286	273	180	1,336	25·2	5	12	7
Markwell and Son: Black Orpingtons.	263	183	231	284	‡245	‡87	‡1,303	25·6	5	7	0
C. E. Messervy: Rhode Island Reds	†116	224	224	207	226	§271	1,268	25·8	4	17	11
C. Judson and Son: Black Orpingtons.	195	272	*158	220	210	206	1,261	25·6	5	3	7
F. S. Horner: Black Orpingtons...	138	264	210	198	249	197	1,256	25·5	5	7	4
Mrs. C. E. Madrers: Black Orpingtons.	168	292	‡88	233	‡210	253	‡1,244	24·7	5	3	11
W. W. Tennent: Black Orpingtons	267	225	‡214	193	98	253	‡1,250	24·8	5	3	8
G. E. Holmes: Black Orpingtons...	200	*116	261	231	‡200	‡218	‡1,226	24·9	4	18	8
H. Taylor: Black Orpingtons ...	*158	171	‡172	†215	239	‡267	‡1,222	24·7	5	4	6
R. L. Bray: Black Orpingtons ...	‡205	194	‡258	‡207	‡297	45	‡1,206	23·5	5	2	0
H. Walman: Black Orpingtons ...	251	†245	205	235	215	†36	1,187	25·6	4	14	11
E. J. Whalan: Langshans... ...	187	186	181	237	206	190	1,187	24·9	4	18	9
W. A. Williams (S.T.P.F.): Langshans.	222	189	159	149	‡265	197	‡1,181	25·4	4	11	4
A. Thompson: Black Orpingtons...	‡180	162	‡178	236	242	163	‡1,161	24·8	5	0	1
A. Sinclair: Black Orpingtons ...	163	183	‡282	173	*100	224	‡1,127	25·1	4	17	2
J. J. Wilson: Rhode Island Reds...	‡157	125	†‡112	199	194	‡208	‡1,095	24·5	4	6	10
H. Martindale: Black Orpingtons..	279	94	†128	138	231	218	1,088	25·7	4	13	3
S. Nicholls: Langshans	187	227	*110	170	210	182	1,086	25·1	4	11	5
W. Clayton: Black Orpingtons ...	222	207	195	238	91	124	1,077	25·0	4	10	1
T. F. Braithwaite: Langshans ...	217	90	129	188	232	210	1,066	25·4	4	13	3
Mrs. V. E. Cox: Black Orpingtons	193	‡127	227	170	173	162	‡1,053	25·6	3	16	6
M. and H. Williamson: Black Orpingtons.	189	123	195	196	227	‡100	‡1,030	25·2	4	7	0
S. Lidden: Black Orpingtons ...	‡254	‡38	169	211	45	‡149	‡867	24·7	3	15	6
D. Kenway: Black Orpingtons ...	109	†132	*‡52	91	114	226	‡756	25·8	3	1	6

Egg-yield of Each Bird and Group in the Thirty-first Annual Competition—*continued.*

Owner and Breed.	Individual Score.						Totals of Groups	Weight of Eggs per dozen.	Market Value.
			‖*Light Breeds.*						
F. T. Wimble	262	246	150	274	277	238	1,447	24·8	6 0 0
H. A. Duncan	213	230	235	252	240	‡202	‡1,372	24·7	5 9 1
Bide-a-Wee Poultry Farm... ...	201	‡238	233	196	‡216	‡285	‡1,369	24·7	5 9 7
H. L. Abrook	201	194	‡241	243	223	251	‡1,353	24·8	5 10 10
I. Lowery	248	279	202	‡173	212	238	‡1,352	24·4	5 3 4
H. J. Rose	99	245	215	278	238	257	1,332	25·4	5 12 0
R. Thoroughgood	255	‡192	240	252	144	243	‡1,326	25·0	4 19 10
J. Hunt	218	221	‡146	234	242	‡264	‡1,325	24·9	5 5 6
Morgan and Williams	208	240	239	187	217	209	1,300	25·7	5 2 10
P. Bennett	185	‡198	224	279	188	215	‡1,299	25·2	5 1 5
A. Biden	221	161	228	207	‡215	257	‡1,289	24·6	5 1 8
W. I. Williams	235	246	‡†212	190	‡180	215	‡1,278	24·6	5 12 11
A. C. Witten	113	257	267	199	210	223	1,269	25·2	4 15 1
Mrs. F. McCallum	212	206	‡212	223	205	209	‡1,267	24·9	5 2 10
J. T. Webb	251	‡258	218	197	160	175	‡1,259	25·0	5 3 8
Sunrise Poultry Farm	200	193	163	197	‡276	220	‡1,249	25·1	5 1 5
B. Clarke	‡216	145	‡211	193	206	261	‡1,232	24·4	5 0 9
J. L. Flew	124	203	250	‡243	222	218	‡1,225	25·1	4 17 8
W. C. Hardy...	126	230	214	156	228	267	1,221	25·1	4 18 11
C. Leach and Sons	228	188	227	208	140	228	1,219	25·0	4 15 11
H. Holmes	237	227	206	209	212	128	1,219	25·3	4 17 7
C. A. Clark and Son	210	211	152	210	220	215	1,218	25·3	4 16 10
S. E. Daley	242	238	‡105	181	227	195	‡1,205	24·9	4 18 10
D. R. Dove	237	234	148	235	159	187	1,200	25·5	4 17 7
Neal Bros.	159	185	151	240	240	214	1,189	25·4	4 12 11
Mrs. G. Miller	201	207	222	129	198	231	1,188	25·7	4 16 7
J, Donsworth	§205	214	175	119	243	230	1,186	25·7	4 14 11
J. Rayner	†62	197	215	208	‡252	‡249	‡1,183	24·5	4 11 2
J. Cornwell	‡84	‡218	201	‡206	261	209	‡1,180	24·3	4 16 6
L. A. Ellis	194	192	175	‡228	192	191	‡1,173	25·5	4 11 11
G. N. Mann	232	*177	*56	237	243	‡223	‡1,168	25·3	4 14 10
H. and W. Bailey	213	240	79	165	230	240	1,167	25·5	4 14 7
C. C. Norman	193	244	172	253	175	130	1,167	25·4	4 11 0
P. O. Ranch...	168	†116	239	173	230	238	1,164	25·5	4 14 6
Watson and Stepney	§196	211	160	132	231	234	1,164	25·7	4 13 6
H. R. Nelson	132	234	145	232	174	‡235	‡1,152	25·1	4 10 0
W. H. Rogers	173	†94	243	‡209	214	219	‡1,152	25·0	4 14 3
Mrs. M. Graham	208	240	221	144	121	216	1,150	25·5	4 11 2
W. J. Scarboro	163	216	217	207	212	‡231	‡1,246	25·1	5 2 0
K. G. Cobcroft	196	185	120	188	‡239	‡117	‡1,145	24·9	4 1 8
K. H. Harris	132	250	224	‡216	193	‡129	‡1,144	24·4	4 11 5
R. Whitelaw, junior	‡127	169	205	207	170	258	‡1,136	25·0	4 9 1
K. R. Slade	214	198	†10[illegible]	183	214	215	1,132	25·5	4 8 3
Success Poultry Farm	‡186	276	‡116	†141	212	199	‡1,130	24·8	4 13 5
A. A. Wesley	269	266	‡258	‡62	*91	‡183	‡1,129	23·7	4 18 4
F. A. Bailey	167	165	157	251	206	173	1,119	25·3	4 6 0
F. B. Mullens	*168	206	†188	‡158	196	‡184	‡1,100	25·0	4 7 9
T. McDonald	186	245	240	210	‡88	*120	‡1,089	25·1	4 11 3
J. Jefferson	102	158	182	167	194	274	1,077	25·7	4 7 11
A. E. Passlow	189	133	148	174	200	223	1,067	25·8	4 13 2
J. Bradford and Son	198	214	201	‡235	158	58	‡1,064	25·2	4 5 9
F. T. Turner...	§216	231	0	241	215	157	‡1,060	25·6	4 6 9
F. G. Lombe	156	226	168	146	170	*193	1,059	26·1	4 8 9
R. B. Dent	156	211	‡113	221	203	115	‡1,019	25·8	4 1 0
S. J. Evans and Son	*91	*138	251	233	‡134	163	‡1,016	25·6	4 5 8
¶A. P. Leth	184	165	180	†157	144	173	1,008	26·1	4 10 4
R. G. Christie and Son	152	‡238	*‡40	187	176	202	‡995	24·8	3 19 1
F. M. Bailey	163	169	‡219	195	*27	217	‡990	25·4	3 16 11
A. R. Wheatley	188	121	*‡30	190	200	‡226	‡955	25·0	3 17 1
G. Hill	200	174	87	60	163	260	944	24·7	3 16 6
V. C. Tunnicliff	‡138	‡186	‡194	215	‡21	57	‡811	24·3	3 6 1
G. T. Whittaker	232	97	101	145	0	223	‡798	25·7	3 3 6

* Signifies bird dead; not replaced, original score retained.

† Signifies bird replaced: original score eliminated.

‡ Has not met the requirements that each hen in the group must lay eggs averaging 2 oz. for seven eggs laid successively between 1st to 31st July (with extension to 15th August for hens which have not laid seven eggs in that period).

§ Ineligible for individual prizes through eggs not reaching prescribed weight during July, but attained by 15th August.

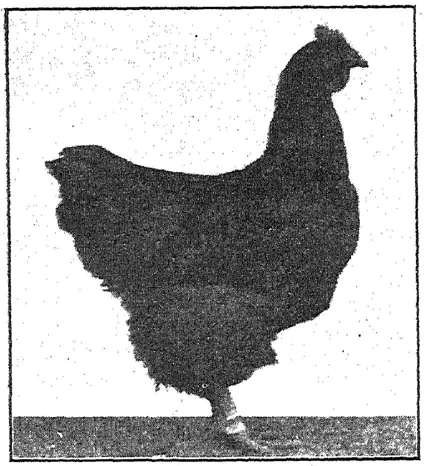
‖ All entries were White Leghorns, except that of Mr. A. P. Leth, which consisted of Minorcas.

¶ This entry was a pen of Minorcas.

THE POULTRY EXPERT'S COMMENTS.

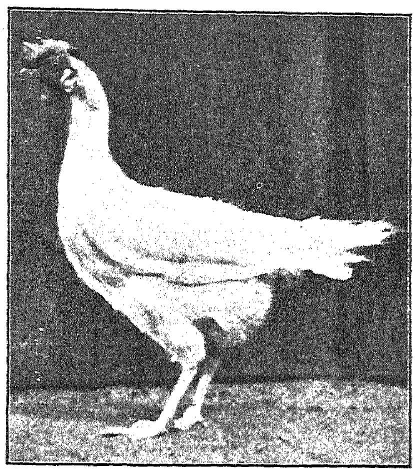
The chief feature of the test just concluded is the fact that Langshans have carried off the two coveted prizes, Mr. F. C. Nicholls' pen having won the Grand Champion prize for the greatest value of eggs and also the Golden Egg Trophy donated by the Metropolitan Meat Board, the group score being 1,439 eggs, and the market value, £6 1s. 8d. This breed has also put up the highest average egg production, viz., 199 eggs, compared with 197 for Black Orpingtons and Rhode Island Reds, and 192 for White Leghorns.

The fact that Langshans have put up such a good performance should tend to bring this breed the prominence which it deserves as a utility fowl. During recent years the commercial breeds have been practically narrowed down to



Mr. A. Greentree's Black Orpington.

Winner of the prize for the greatest number of eggs in the Heavy Breeds Section.



The Best White Leghorn.

This bird, entered by Mr. I. Lowery, laid the greatest number of eggs in the Light Breeds Section.

two, Leghorns and Orpingtons, which is not good for the industry, and it would be a decided advantage if some other breeds could be developed to the same level as the two mentioned.

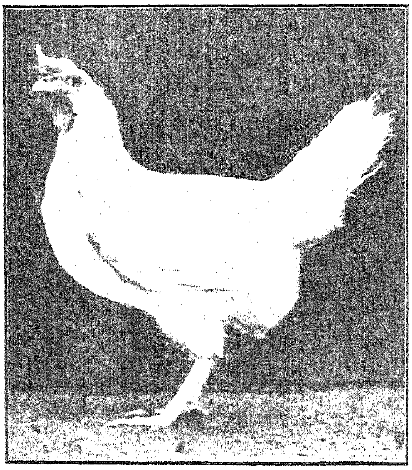
The prize for the highest group score in the light breeds goes to Mr. F. T. Wimble, whose group laid 1,447 eggs, valued at £6. The M.I.B. Trophy for the group in the section opposite to that winning the Golden Egg, awarded on the same scale of points has been won by Messrs. C. A. Clark and Son, who also wins the J. Hadlington Commemoration Medal.

The highest individual score was put up by a Black Orpington hen, the property of Mr. A. Greentree, and two birds tied for the leading individual score in the light breeds, these being owned by Messrs. I. Lowery and P. Bennett; Mr. Lowery wins the prize on value of eggs.

Weight of Eggs.

Although there were a large number of disqualifications of individual birds for underweight eggs, due to the altered system of weighing, the average

weight for the whole competition shows a slight improvement on last year, being 25·3 oz. compared with 25 oz. last year; the averages for the light and heavy breeds respectively this year were 25·4 oz. and 25·2 oz.



One of Messrs. C. A. Clark and Son's Group.
Winners of the Golden Egg Consolation Prize, and the Hadlington Memorial Medal.

It will be remembered that prior to this test the weight of eggs was decided during July, when each hen's eggs were weighed until an egg reached 2 oz. when the hen was regarded as laying full weight eggs. In this test the average weight was taken of seven eggs laid consecutively, with the result that many hens while laying eggs of the required weight laid some which were under weight, thus bringing the average down below the standard. In the next test, however, this rule has been altered to provide for the weighing of all eggs laid by each hen during the month of August, and any hen which does not lay twelve eggs during that month will be allowed until the 15th September to comply with the rule.

Breeders should concentrate upon the matter of improvement in size of eggs, and this can only be done by careful selection of the breeding birds, and the eggs for incubation.

The Financial Aspect.

The figures regarding cost of feeding, based upon ton lot prices plus freight and cartage, show that the cost per hen was 7s. compared with 5s. 9d. last year, and the average net price of eggs was 1s. against 1s. 0½d. last year. Thus on an average production per hen per annum of twelve dozen, the return per hen over cost of feed was 1s. 9d. less than last year.

It should be understood that these figures are not based upon the cost of feed purchased at the College, but on prices applicable to the average commercial poultry farmer.

Concrete for Poultry House Floors.

A correspondent recently inquired of the Department as to how to mix concrete for his poultry houses, the total floor space of which was 20 feet by 10 feet.

A floor space of 20 feet by 10 feet and 3 inches thick, with concrete gauged one part cement, three parts sand and five parts metal crushed to ¾-inch guage, will require nine bags of cement, 1 cubic yard of sand and 1¾ cubic yards of metal. The concrete should be screeded and floated to a smooth surface without top-dressing.

Poultry Notes.

May.

E. HADLINGTON, Poultry Expert.

Care of Breeding Stock.

One of the chief considerations during the breeding season is to keep the breeding stock in good condition, and it is only by so doing that the best results can be expected. This is where keen powers of observation are necessary—to see immediately when anything is amiss with the birds, instead of allowing ailments to become very pronounced before they are detected, which may mean that affected birds are rendered useless for the remainder of the season. To the quick observer, a bird's comb becoming dark in colour, a slight listlessness in the appearance of a bird, and a disinclination for food are signs of impaired health, and frequently a timely dose of Epsom salts (a teaspoonful of salts damped so that it will hold together until placed in the bird's mouth) will save further complications.

Feeding the Breeders.

Care should be taken to see that the ration fed to all the breeders does not contain too high a percentage of concentrates, as this is often the cause of poor hatches. It is a safe plan to use not more than 5 per cent. of meat meal or other concentrates equally high in protein for the breeding stock, and it would be advantageous to add about 2 per cent. of bone meal in place of 1 per cent. of meat meal for breeding birds, making 4 per cent. meat meal and 2 per cent. bone meal.

Feed the Male Separately.

It often happens that the male bird allows the hens to eat up the food and does not get sufficient for himself, and consequently he becomes poor. When this occurs it is common to see the male rush ravenously for the food, and it is thought that he is becoming too greedy, but this is a sure sign that he is being starved. The best means of guarding against this trouble is to give the male bird a feed of whole maize by himself at midday. This can be done by shutting the hens in the house and feeding the male in the yard. At first a little difficulty may be experienced in separating him from the hens, but the birds soon become accustomed to the practice and are quite easy to manage after a week or so. The trouble entailed in feeding all male birds at midday, whether there appears any necessity for it or not, will be amply repaid in the improved hatching results obtained.

It is a wise plan to handle the "head of the pen" every week or so during the breeding season to make sure that he is keeping in good condition, because neither good hatches nor strong chicks can be expected from poor males.

Look for Vermin.

Periodical examinations should be made of the male birds to see that they are not infested with vermin, which often results in a high percentage of infertile eggs, or "dead in the shell" chickens. A simple means of ridding the birds of body lice is to paint a thin line of commercial nicotine sulphate (40 per cent.) along the perches shortly before the birds go to roost. Care is necessary not to apply the solution too liberally or to spill any where the birds may pick it up, because it is highly poisonous. A sure indication of a heavy infestation by body lice is a broken condition of the feathers around the thighs and abdomen of the birds, or a redness of the skin of the abdomen, particularly at the base of the tail, which is a favourite location for body lice.

Other methods may be adopted to get rid of these parasites, but all involve handling the birds individually. Flowers of sulphur dusted thoroughly through the feathers of the birds will prove effective, or a few pinches of sodium fluoride placed on different parts of the body, particularly around the abdomen, will serve the purpose.

Red Mite.

It is also essential to keep the houses free from red mite, but these parasites have to be dealt with in an entirely different manner to the body lice, as they are bloodsuckers and nocturnal in their habits, secreting themselves in the daytime under the perches or in any crevices nearby. The name "red mite" is misleading to many beginners, because the mites may be found in three different colours. They are only red after they have engorged themselves with blood, but commonly they are grey in colour, and, when young, are white.

Painting the perches occasionally with wood-preserving oil, creosote, residual oil, or even the waste oil from motor cars, will usually keep the pest under control. It is advisable to do the painting early in the day and allow the perches to stand end up outside the pens so that they will not be wet when the birds go to roost.

When the mites are found in the walls of the houses and in the nests, etc., it is necessary to spray the houses thoroughly, and about the cheapest and most effective spraying solution is kerosene emulsion. This should be sprayed with a force pump into all the crevices both inside and outside the house, also the roof, floor, and nests. Where the infestation is a bad one it is often necessary to spray again a day or so later.

The emulsion is made by dissolving ½ lb. soft soap in a gallon of boiling water, after which a gallon of kerosene is added slowly, stirring all the time and for a couple of minutes afterwards to ensure that the oil and soapy water are thoroughly incorporated. The mixture, called the "stock," is then added to 8 gallons of soft water and stirred well; it is then ready for use. It is also advisable to stir the solution occasionally while spraying.

Size of Eggs.

A most important matter in connection with the breeding season which should be kept constantly in mind is the question of the size of eggs. There is a temptation in the early part of the season, when eggs are scarce, to use a percentage for incubation which does not come up to the required standard. Then the next season some of the early birds used for the breeding pens may be from the small eggs, which would tend to perpetuate the trouble. Therefore, it should be made a hard and fast rule that no eggs under 2 ounces in weight be used for incubation. The fact that the percentage of small eggs in our competitions is on the increase, and also that this is a problem to be dealt with in connection with marketing and export operations, should cause the poultry farmer to make greater efforts to increase the size of eggs from the whole flock.

It should be realised that the remedy lies in the poultry farmer's hands, and it is only by persistent effort that improvement will be effected. The production of larger eggs would make a material difference in the profit to the farmer, by increasing the number of first-grade eggs. Now is the time to commence building up, and the first step is to see that breeding stock of sound physique only are used, and follow this up by a rigid selection of eggs for incubation.

A Tonic After the Moult.

A tonic given to the birds at this time of the year, as they are recovering from the moult, will assist materially to bring them into laying condition again; it will also benefit birds recovering from chicken-pox. One of the best and cheapest tonics for poultry is Douglas mixture, which is easily compounded.

The preparation is made as follows:—Dissolve 8 oz. of sulphate of iron and 8 oz. of Epsom salts in 1 gallon of boiling water; let this cool, then add an ounce of dilute sulphuric acid. Care should be taken to obtain the acid in dilute form, not the concentrated sulphuric acid, which is of much greater strength. Most chemists are able to supply all the ingredients required, and the mixture can be made up for about 6d. per gallon. When the mixture has been prepared it should be stored in a glass, porcelain, china, or earthenware vessel and labelled as poison. The dose is one tablespoonful to each gallon of drinking water, and should be given four to five times a week for about a month, or longer if necessary. It is useless to give only a few doses, a regular course of treatment being necessary to bring about the desired effect.

Some poultry farmers hesitate to use this tonic because they think it is likely to rust the iron water-vessels, but if made and used in accordance with the directions given above it will have only a staining effect upon the vessels. It will, however, cause kerosene tins to rust through somewhat quicker than usual.

Hawkesbury College Laying Competition.

A pleasing feature of the egg-laying test just commenced at Hawkesbury Agricultural College is the improvement in the type of birds penned in the Australorp section, although there are still some which fall far short of what could be desired from the point of view of breed character. Breeders who wish to improve their flocks to conform more closely to the standard should study this aspect during the coming breeding season, and pay particular attention to selection for type and size. Of the birds rejected in this section the majority was entirely lacking in type, some having long high tails, whilst others were angular or extremely narrow, being not much deeper in body than birds of a light breed.

In the Leghorn section there is also some improvement as far as uniformity is concerned, but here again a percentage of the birds penned were far from typical of the breed and lacked size and length of body, which is one of the chief characteristics of the Leghorn. One breeder who had several birds rejected remarked that it appeared as if the competition was being turned into a show rather than a laying test. It is this attitude that leads to the degeneration of breeds, of which the Silver Wyandotte and several other once popular breeds are examples. The fact is that most birds entered in the competition are intended to be used as breeders if they put up good records, and, therefore, should be fair specimens of the breed, which is all that is insisted upon. As a matter of fact, one would look for a much better class of birds for the breeding pen than many which are sent to the laying test, particularly if it is desired to breed stock reasonably true to type and sufficiently robust in physique to stand up to the strain of high production.

It should be realised that there is more in breeding for high fecundity than merely using birds which have been exceptional layers, and if this were more fully appreciated only the best class of pullets which could be selected would be sent to the competitions.

Winter School for Farmers, Poultry Farmers, etc., 1933.

Winter Schools will be held at Hawkesbury Agricultural College, Richmond, from the 27th June to the 14th July, 1933, the duration of the different courses of instruction and the fees charged being as follows:—

Poultry Farming (27th June to 14th July), fee £3 10s.

Dairy Farming—Cattle and pigs (4th to 14th July), fee, £2 5s.

The fees charged for each course include board and lodging, tuition, and medical attention.

The courses of instruction will be open to both sexes over 16 years of age. Intending students will enter into residence on the first-named date in each case. No examination is required for entrance to these courses. Further particulars can be obtained from the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

CONTENTS.

VOL. XLIV. PART 6. JUNE 1, 1933.

Agricultural Gazette of New South Wales.

Conference of Ministers for Agriculture.

HELD IN SYDNEY, 15TH TO 19TH MAY, 1933.

AFTER an interval of four years the annual interstate Conference of Ministers for Agriculture was revived this year. The Conference, which was convened by the Hon. Hugh Main, M.L.A. (N.S.W. Minister for Agriculture), was held in the Executive Council Chamber, Chief Secretary's Buildings, Sydney, from 15th to 19th May. Mr. Main presided, the conference being officially opened by His Excellency the Governor of New South Wales, Sir Philip Woolcott Game, G.B.E., K.C.B., D.S.O.

Members of the Conference.

New South Wales.—Hon. Hugh Main, M.L.A., Minister for Agriculture (Chairman).

Victoria.—Hon. J. Allan, M.L.A., Minister for Agriculture.

Queensland.—Hon. F. W. Bulcock, M.L.A., Minister for Agriculture and Stock.

South Australia.—Hon. A. P. Blesing, M.L.C., Minister for Agriculture.

Western Australia.—Hon. H. Millington, M.L.A., Minister for Agriculture.

Tasmania.—Hon. A. L. Wardlaw, M.L.C., Minister for Agriculture.

Departmental Officers.

New South Wales.—Mr. G. D. Ross, Under Secretary for Agriculture; Mr. A. H. E. McDonald, Director of Agriculture; Mr. Max Henry, Chief Veterinary Surgeon; Mr. L. T. MacInnes, Director of Dairying; Mr. C. G. Savage, Director of Fruit Culture; Mr. A. A. Watson, Director of Marketing; Mr. G. S. Jolly, Secretary to Minister; Mr. H. Luckman, Conference Secretary.

Victoria.—Mr. H. A. Mullett, Director of Agriculture; Mr. E. A. Kendall, Chief Veterinary Inspector; Mr. J. M. Ward, Superintendent of Horticulture; Mr. J. T. Thynne, Secretary to Minister; Mr. E. H. Neal.

Queensland.—Mr. R. Wilson, Assistant Under Secretary for Agriculture; Mr. R. P. M. Short, Senior Clerk.

South Australia.—Professor A. J. Perkins, Director of Agriculture; Mr. Geo. Quinn, Chief Horticultural Instructor; Mr. H. B. D. Barlow, Chief Dairy Instructor; Mr. C. F. P. Anderson, Poultry Expert; Mr. L. S. Smith, Secretary to Minister.

Western Australia.—Mr. G. L. Sutton, Director of Agriculture.

Tasmania.—Mr. F. E. Ward, Director of Agriculture; Mr. H. C. Smith, Secretary.

The Governor Opens the Conference.

After supporting the Chairman (Hon. Hugh Main) in cordially welcoming visiting Ministers and officials, and expressing his pleasure at being accorded the privilege of declaring the conference open, His Excellency Sir Philip Game assured the gathering of his intense interest in the welfare of the primary industries of this country. "I think," His Excellency continued, "that perhaps the importance of your work is only equalled by its

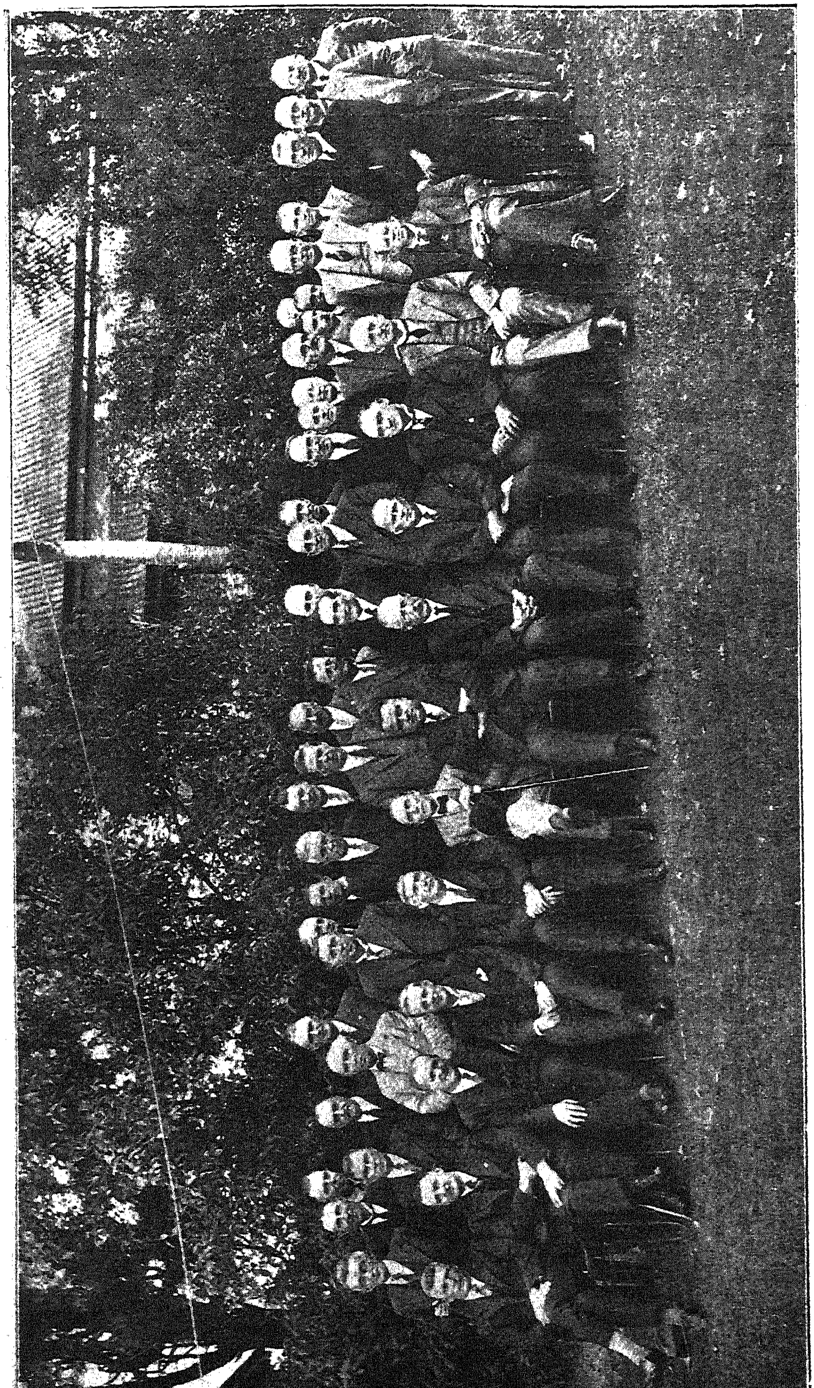
Names of Ministers and Officials in the Photograph.

Seated in front (from the left):—Hon. F. A. Chaffey (Chief Secretary, N.S.W.); Hon. A. L. Wardlaw (Minister for Agriculture, Tas.); Hon. F. H. Stewart (Federal Minister for Commerce); Hon. F. W. Bulcock (Minister for Agriculture, Q.); Hon. Hugh Main (Minister for Agriculture, N.S.W.); Sir Philip Game (Governor of N.S.W.); Hon. B. S. B. Stevens (Premier of N.S.W.); Hon. J. Allan (Minister for Agriculture, Vic.); Hon. M. F. Bruxner (Minister for Transport, N.S.W.); Hon. A. P. Blesing (Minister for Agriculture, S.A.); Sir John Peden (President of the Legislative Council, N.S.W.); Sir Daniel Levy (Speaker, Legislative Assembly, N.S.W.).

Second row (from the left):—W. B. Gurney (Entomologist, N.S.W.); G. D. Ross (Under Secretary for Agriculture, N.S.W.); G. P. Darnell-Smith (Government Botanist, N.S.W.); L. S. Smith (Secretary to Minister, S.A.); L. T. MacInnes (Director of Dairying, N.S.W.); E. Griffiths (Chief Chemist, N.S.W.); C. G. Savage (Director of Fruit Culture, N.S.W.); H. Thompson (Federal Department of Commerce); A. H. E. McDonald (Director of Agriculture, N.S.W.); J. M. Ward (Superintendent of Horticulture, Vic.); G. Quinn (Director of Horticulture, S.A.); R. Wilson (Assistant Under Secretary of Agriculture, Q.); H. C. Budge (Secretary to Governor, N.S.W.).

Back row (from the left):—H. Luckman (Conference Secretary, N.S.W.); C. F. P. Anderson (Poultry Expert, S.A.); G. A. H. Holborrow (Manager, Government Grain Elevators, N.S.W.); H. D. B. Barlow (Chief Dairy Instructor, S.A.); F. E. Ward (Director of Agriculture, Tas.); H. R. Seddon (Director of Veterinary Research, N.S.W.); E. A. Kendall (Chief Veterinary Inspector, Vic.); Max Henry (Chief Veterinary Surgeon, N.S.W.); R. W. Adamson (Engineer-in-Charge, Grain Elevator Construction, N.S.W.); R. P. M. Short (Senior Clerk, Department of Agriculture, Q.); H. C. Smith (Secretary to Minister, Tas.); A. J. Perkins (Director of Agriculture, S.A.); E. H. Neal (Department of Agriculture, Vic.); H. Wenholz (Director of Plant Breeding, N.S.W.); R. J. Noble (Biologist, N.S.W.); A. A. Watson (Director of Marketing, N.S.W.); G. L. Sutton (Director of Agriculture, W.A.).

difficulties, and you share those with the rest of the world, and the outstanding difficulty, I suppose, all over the world is to find the way to cover the cost of production and pay the living expenses of the producer. How are we going to solve it? In looking over the agenda of your conference I was interested to find that about twenty-six items out of sixty-three dealt directly with marketing, and its problems. Obviously you are perfectly right to do your very best to obtain a good footing in existing markets, to improve, continually, your marketing machinery, and more than all, to open up new markets. I suppose the problem in regard to the existing markets cuts both ways. No doubt it helps the producer concerned, but



Delegates and Officials who attended the Conference of Ministers for Agriculture, Sydney, May, 1933.

The names of those comprising the group are shown on the opposite page.

that help is to some extent got at the expense of other countries. Everybody is doing exactly the same thing. Every country to-day is striving, and has to strive, to sell its products, and one wonders whether the system of intensive competition which results can continue to work without a certain amount of amendment. However, that is an aspect of the matter that both ignorance and expediency make me loth to embark upon. But I do think one can say that the only permanent solution must come, to a certain extent now, through more consumption; that is, by the raising of the standard of living throughout the world. Our products are of a kind that mankind wants, and a way must be found to make it worth while to grow them, and distribute them. I see one item in your agenda—the question of opening up the far Eastern market. If you can only raise the standard of living of the millions in Asia it will do a great deal to solve the world's problems, and also to solve our local problems. Anything that Australia can do in that way will be not only of benefit to itself, but of very great benefit to the world at large."

Co-ordination of State Activities.

Discussion ranged over a wide variety of topics connected with the advancement of agriculture in the Commonwealth and many decisions of a far-reaching nature were agreed to.

Shortage of space in this issue precludes anything but brief mention of the problems discussed, which included improvement of the present position of the dairying industry, uniformity as regards grading dairy produce, herd recording and the manufacture and sale of margarine, assistance by way of a federal subsidy to importers of approved stud stock, the regulation of the sale of stock foods, medicines and vaccines, and the control of the buffalo fly. Considerable significance was attached to the proposals to apply the principle of export and local quotas, as provided for in the Dried Fruits Act, to the dairying industry throughout Australia.

The fruit sub-committee suggested, and conference agreed to, revision of the grading regulations for pears, apples and citrus with the object of conforming to the grade designations adopted by all our leading competitors in the world's market for fresh fruit. Other items of interest to the fruit industry included consideration of uniform grade and packing standards, uniform maturity standards, and the early adjustment of the New Zealand embargo on Australian fruit.

The desirability of adopting Commonwealth-wide wheat standards also came up for discussion, but the time to change over from the present system was considered inopportune.

Other items to engage the attention of conference were the co-ordination of certain Commonwealth and State activities, the effect of the tariff on primary export industries, interestate restrictions for the prevention of the introduction of diseases and pests, and the constitution of marketing boards for various products.

It was decided to hold the next conference in Hobart, probably in February, 1934.

Experimental Baking Tests.

Their Value and Interpretation.

E. GRIFFITHS, B.Sc., Chief Chemist; L. S. CAYZER, B.Sc. (Agr.), Assistant Analyst; G. W. NORRIS, Assistant Analyst; and H. WENHOLZ, B.Sc. (Agr.), Director of Plant Breeding.

Baking quality is a term which is generally used to indicate the qualities of wheat or flour which make it suitable for the manufacture of bread. There is by no means entire agreement amongst bakers as to what constitutes flour of the highest baking quality, since the methods of baking are by no means uniform, nor are the standards identical by which bread is judged. Different countries have, however, developed general methods of making bread according to the quality of flour which is available to them. In Canada and the United States of America the public demand is for a loaf of large volume, such as is made from the strong flour or high quality wheats grown to a large extent in those countries. In other countries, such as Great Britain and Europe, where soft wheat of comparatively low flour strength is produced, the consumer does not demand such large loaf volume, but the baker desires flour of better quality for the manufacture of good bread than can be produced entirely or largely from the home-grown wheat. In importing wheat, therefore, to meet their requirements, there is a preference for high quality or strong flour wheats for use in blending with the home-grown wheat to improve its bread-making qualities.

Colour, Gas Production and Retention.

It has been indicated that the miller first of all desires wheat of good milling quality, *i.e.*, clean, sound, bright, plump grain of good bushel weight, which will be easy to condition and to mill and which will produce flour of good colour and good baking quality.

Colour of flour is important since the general public demand is for as white a loaf as possible. Most flours have a natural decided yellowish tinge, but as the practice of artificial bleaching is now fairly general, the colour can be regulated according to the desire of the purchaser. There are other factors, however, which give a colour to flour which cannot be removed by bleaching. The presence of bran particles, which occur more abundantly in low-grade straight run or badly milled flours, causes a brownish or reddish tinge, while a dirty grey colour may be due to immature, unsound or sprouted wheat. Although the crumb colour of the bread is influenced to a certain extent by the texture and volume of the loaf, it is mainly dependent on flour colour, since a loaf of good colour cannot be made from a flour of poor colour.

Apart from flour colour, the baking quality of a flour depends on two main sets of factors:—

1. Those factors making for gas retention in the dough;
2. Those factors responsible for gas production.

That is to say, the volume of gas produced in the dough must be adequate and the quality of the flour must be such that at least a large percentage of the gas must be retained so that the loaf will be of sufficient volume and good texture.

The degree of gas retention is mainly a function of the gluten of the dough, both the quality and quantity of which are important. Good bread cannot be made from flour of low gluten content, nor from flour of poor gluten quality. Such flour is called weak and of poor baking quality, because it will not stand much working or fermentation, and, moreover, it usually has a low water absorption. Generally speaking, flour of high water absorption capacity is desired, as it yields more loaves to the sack and the bread has a better texture than is produced from flour of low water absorption capacity.

Factors Influencing Gas Production.

It is obvious that a loaf of large volume and good texture cannot be made if the production of gas by the yeast is insufficient to stretch and extend the gluten in the dough. The production of gas is dependent on food supply for the yeast in the form of sugar. All flours contain sugars, usually about 1 per cent. sucrose or cane sugar and a small amount of maltose or other sugars. This sugar is insufficient to supply the necessary yeast food throughout the fermentation process. The deficiency is rectified by the action of a ferment or enzyme called diastase, which is present to a varying extent in all wheat and in grains generally. The enzyme diastase acts upon the starch of the flour, hydrolysing it and forming maltose, which is acted upon by the yeast, with the formation of alcohol and carbon dioxide. As the original sugar present in the flour is insufficient to supply all the gas for the making of light bread, the presence of the diastase is of great importance, the gassing power of a flour being generally proportional to the diastatic activity.

In soft wheats, the starch cells may be readily accessible to the yeast organisms after being acted upon in this way by the diastatic enzymes, but in hard wheats the starch cells are largely embedded in glutenous matrix and may not be so readily accessible. Activity of other enzymes such as peptase and cytase may be necessary to make the starch granules accessible to the diastatic enzymes before they can be converted into sugars for the food supply of the yeast. Gassing power may therefore involve the combined activity of peptase to alter the physical character of the glutenous matrix surrounding the starch cells, cytase to dissolve the cellular tissues forming the cell walls of the starch cells, and finally diastase to convert the starch into maltose.

A Combination of Factors Constitutes Baking Quality.

The flours milled from some wheats lack gassing power. This feature is usually attributable to the environment, but certain varieties are also known to be poor gassers. A shortage of maltose at the end of the fermentation period of the dough will be revealed in a loaf of anaemic crust

colour and flat flavour, but this condition is generally avoided in baking practice by the addition of malt extract, sugar or malt flour. A longer conditioning period for the grain before milling may also be found useful in improving the gassing power of some samples, more especially wheats of hard texture. A marked deficiency of gassing power will be reflected in a loaf of small volume and poor texture.

Characteristics of the baked loaf which are important to the baker, are the volume, weight and appearance of the loaf, the texture, colour and "pile" of the crumb, the nature and colour of the crust and the flavour. Baking quality is thus the sum of a number of factors, and a flour may be undesirable commercially and of poor baking quality, if it is markedly deficient in one or more of these factors.

It has been shown that apparently reliable methods have now been devised for determining the baking strength (which largely constitutes the baking quality) of a flour by the character of the dough during the mixing and fermentation prior to baking. But only practical baking tests will best determine the value of the flour for individual baking requirements. Experimental or laboratory baking tests have therefore been devised in most countries to give some indication of the commercial baking qualities of different wheats.

Is the Experimental Baking Test a Reliable Guide?

Although some commercial millers and bakers have criticised the value of the small experimental baking test, mostly because of the small size of the loaf produced and because the methods used for the sake of expediency in such tests differ somewhat from those employed in commercial baking practice, many now recognise the value of these tests. All leading cereal chemists consider that the small experimental bake generally gives a very reliable indication of the commercial baking value of the wheat. The results obtained are most valuable when the experimental bake is used relatively, *i.e.*, when the baking quality of a flour is compared always with that of a certain standard flour baked at the same time, under the same conditions. Without a training in experimental methods it is difficult for the commercial man to realise that the results of any test are better expressed as a relative measure rather than in absolute terms. This applies particularly to the analysis of results from tests designed to indicate the baking quality of wheat or flour.

When the experimental baking test is used to determine the relative baking quality of a variety of wheat, certain further precautions must be observed. It has been shown that baking quality depends both on the quantity and quality of the gluten contained in wheat, and that these characters, though determined mainly by the variety, are largely influenced by the environment (chiefly climatic) in which the wheat was grown.

While the commercial baker is chiefly concerned with the baking quality of the blend of flour procured from the miller, the miller is concerned with the baking quality or the value for special purposes of each component part

of the blend. He is therefore interested in the baking quality of a sample of wheat as it is actually influenced both by the variety and the conditions of its growth. Unless he knows the relative baking quality of a variety of wheat to be particularly good, he is more interested in the source of the wheat, since he usually knows well the general influence of climate or season on the "strength" of the flour or on the baking quality. But it is the cereal chemist who must, particularly for the sake of the breeder, and also for the advantage of the merchant, miller and baker, be able to evaluate the baking quality of a variety of wheat, particularly of a new variety, in a way which will, as far as possible, eliminate the environmental or climatic influence on quality.

It is obvious, therefore, that the baking quality of a variety of wheat cannot be properly determined except by its relation to a standard variety grown under the same conditions, *i.e.*, during the same season, on the same soil and, if possible, also maturing at approximately the same time. Furthermore, it is not safe to characterise the baking quality of a variety from a single test. It should be tested in comparison with the same standard variety or with one whose baking quality is well known, when both are grown together under various climatic conditions, and also in different seasons. The sum of the knowledge gained from such tests will determine the relative baking quality of the variety in comparison with the known standard.

Information is also gained from similar tests as to the relative influence of the climate on the baking quality of the variety.

Baking Test Methods.

The object of the experimental or laboratory baking test is to determine the comparative value or baking quality of different samples of wheat or flour. The chief object underlying such tests, from the standpoint of the breeder, is to determine whether a new variety is of higher or lower baking quality than some existing variety which it is expected to replace, or to determine what varieties or strains of a crossbred wheat are superior in baking strength.

The methods used in the baking test should therefore serve to differentiate most readily wheats of different flour strengths. It has been shown that, with the optimum conditions for absorption, fermentation time, etc., flours of different strengths can be made to show approximately the same baking strength as determined by loaf volume. As far as possible, therefore, the baking test method should be standardised to bring out differences in loaf volume, etc., between different wheats or flours, and the baked loaf should be judged for its excellence in other characters.

In most countries where laboratory baking tests are made, a standardised method has been adopted to suit the general quality of the blend of flour used in that country. However, there are some things which cannot be exactly standardised, such as the amount of water absorbed by or added to

the dough, and the length of the fermentation period. These are factors which themselves indicate quality to some extent, and which differ considerably in different samples of wheat.

In America and Canada, where high quality wheats are grown, or where hight quality is at a premium and where high speed mechanical dough mixing machines are used in the modern bakehouse, a long fermentation period in relation to the quantity of yeast added is usually given in test bakes. Following is the standard method used by the American Association of Cereal Chemists, as reported by Blish ([1]).—Yeast 3 per cent. (of weight of flour), salt 1 per cent., sugar 2.5 per cent., distilled water 58 per cent. Dough temperature 30 degrees C. First punch after 105 minutes, second punch 50 minutes after first punch. Moulding 25 minutes after second punch. Proofing period 55 minutes. This formula is apparently very suitable to determine the baking quality of strong flours when a standard like Marquis is used, but with this quantity of yeast the fermentation period would be too long for Australian wheats of low flour strength.

This formula has now been accepted by the majority of cereal chemists as a standard method, certain modifications chiefly involving the amount of water added and the fermentation period being used according to the special conditions in the country where the method is used or according to the class of flour which is most typical of that country.

Tests supplementary to this standard method, such as the bromate differential, blend bromate, malt phosphate, over-mixing and prolonged fermentation tests have been designed to test special features of a flour. These tests are used extensively in Canada and to a lesser extent in U.S.A., and all, with the exception of the malt phosphate test, are designed to test for reserve strength and ability to withstand mechanical abuse. The malt phosphate test is used with poor gassing flours when information is required as to their gluten quality. The malt and phosphate supply yeast food, the malt supplying sugars for fermentation and the phosphate supplying a most necessary salt for all fermentation processes. The bromate and blend bromate tests are specially designed to differentiate between flours of high strength. By means of this test greater differences are obtained in the loaf volume than by the ordinary standard method in the case of very strong flours. The other supplementary tests such as over-mixing and prolonged fermentation tests are also designed for a similar purpose, and give an indication of the reserve baking strength.

Interpreting the Results of Baking Tests.

The interpretation of the results of baking tests requires discretion and experience. Kent-Jones ([2]) states that after a little experience an excellent idea of the strength of the flour can be judged by the feel and spring of the dough near the end of the fermentation period. A weak flour which has had its optimum treatment will often give a larger loaf than a stronger

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(1) J. W. Blish. "The Baking Test," *Cereal Chemistry*, 5 (1928), 158–161.
(2) Kent-Jones, Modern Cereal Chemistry, 1925, p. 125.

flour which has been under-fermented. It is for this reason that dough tests have been devised to determine baking strength, and these may be considered to be superior to interpreting the baking test results chiefly or solely by the size of the loaf. Kent-Jones considers that if this is to be done, it is better to make cottage loaves than tin, since a fairly weak dough will make an appalling cottage loaf, but quite a satisfactory tin loaf. In the former case there is nothing but the inherent strength of the dough to make the loaf stand, whereas in the tin loaf the dough does not have to rely on its own strength to hold up but is supported by the sides of the tin. However, with the low-sided tins now generally in use the dough does not get very much support, except during the early part of the "proving" period. In the hands of an experienced baker, laboratory baking tests with the use of shallow baking tins are of great value in differentiating between wheats of different flour strength, provided a suitable standard formula is used, with supplementary tests in special cases.

Moreover, in addition to loaf volume, the test bake is used to evaluate other important characters which largely determine the commercial baking value of the wheat. A light loaf of relatively good size or large volume is generally an indication of good flour quality, but large loaf volume and high baking strength or quality are not always synonymous. While a relatively small loaf volume may cause a flour to be viewed with suspicion as being of low strength, it is sometimes possible that a loaf of relatively good volume may be obtained from flour which is not of good strength. For this reason, it is desirable to record other observations on the baked loaf, such as texture, colour, pile, bloom, etc., and to interpret these, if possible, as a measure of the commercial baking quality of the wheat.

Texture an Important Characteristic.

Probably one of the most important characteristics of the baked loaf is its texture. The pores or air spaces should be somewhat elongated, uniform in size, evenly distributed and comparatively small and numerous, rather than large and few in number, and the cavity walls should be thin and transparent. The walls should be tender and not easily crumbled, and the bread should be firm, but should not have a tight or solid structure. Such a loaf would be considered to have good "pile." Australian wheats are generally highly valued for blending because of their "bloom," which refers to the silky soft appearance and resilient touch of the cut surface of the loaf. As an illustration of the care which is necessary in interpreting the results of a baking test, it might be pointed out that large loaf volume and desirable crumb texture are not always related, since one may be improved at the expense of the other. If the dough is allowed to ferment nearly to the point of maximum expansion before it is ovened, the loaf will generally be coarser in texture and larger in loaf volume than if it were ovened earlier. In conducting comparative baking tests, it seems desirable that the doughs should be allowed to proceed to this point, thus making a coarser loaf than is usual in commercial practice. Differences in quality are thus accentuated.

Colour of crust refers to the top crust of the bread. It is due to the caramelisation of sugars (dextrin) present at the end of the fermentation period. Sugars are necessary for gas production and excess sugars are required for caramelisation. A dark-brown colour of crust is of the most pleasing appearance, being more desirable than a pale colour, which is an indication of poor diastatic activity. This is a very undesirable quality which is, as previously stated, frequently a character of Australian wheats. It is generally characteristic of wheat from regions where the rainfall is comparatively light during the maturing period. This appears to be especially the case when inherently weak flour wheats are grown in a dry climate. Low diastatic activity or poor gassing power is also characteristic of some varieties of wheat when grown under any conditions.

The shape and appearance of the top crust of the loaf is of value in indicating what is termed the "oven spring." The heat of the oven imposes a strain, additional to fermentation, on the elasticity of the gluten, and if the dough responds by rising well without breaking, the top crust of the loaf (especially in tin loaves) will show a rounded contour with smooth unbroken appearance. A broken side crust giving rise to a condition known as "shell top" is an indication of weak flour.

The public generally prefers a loaf with as white a crumb colour as possible. A dull or grey colour caused by immature, bleached or sprouted wheat is most objectionable since it cannot, like a yellow colour, be removed by the use of bleaching agents on the flour. A yellow colour may also be objectionable as some importing countries forbid the use of bleaching agents in imported flour.

A poor flavour seldom occurs with flours from sound wheats.

Value of Experimental Baking Tests.

The baking tests as conducted by the Chemist's Branch of the Department of Agriculture in New South Wales are designed with several objects:—

1. To give a general idea of the commercial baking quality of existing varieties.

2. To indicate the comparative baking quality of a new variety in comparison with existing varieties.

3. To indicate those districts which have a marked influence on the baking quality.

4. To indicate to the wheat breeder the most suitable parent varieties to use in breeding for improved baking quality.

5. To assist the wheat breeder in selecting strains of a crossbred wheat for the best baking quality compatible with yielding ability.

Unless the tests are carefully planned and efficiently carried out and the results correctly interpreted, they will be of little value. On the whole, the experimental baking test has its limitations as far as the breeder is concerned, for he must breed largely for gluten quality, which can be

more easily determined from dough tests than from baking tests. The baking test is, however, desirable for corroborating, if possible, the results of such dough tests, and, moreover, serves to determine the merits or deficiencies of a wheat for blending purposes.

The breeder's chief objective is to evolve highly productive wheats of better baking quality, if possible, than the varieties at present in cultivation. Some form of baking test must be the final court of appeal to evaluate new varieties of wheat, and the laboratory baking test must be carried out as a preliminary determination to estimate the commercial baking quality of the wheat.

The Best Winter Fodders for the South Coast.

TESTS over a number of years have made it possible to narrow down the most suitable varieties of wheat and oats for winter fodders on the south coast and Moss Vale districts to less than half a dozen.

In reporting on the results obtained last season, Mr. R. N. Makin, Senior Agricultural Instructor, points out that a trial at Penrith had to be abandoned on account of frost damage, while that at Camden was also affected by frost. Heavy rains converted the Moss Vale plot into a bog and adversely affected the yields.

YIELDS IN SOUTH COAST WINTER FODDER TRIALS.

	Milton (A. Kendall).		Berry (J. Schofield and Sons).		Nowra (A. Mattram).		Moss Vale (F. H. O. Throsby).		Kangaroo Valley (J. Chittick and Son).		Camden (J. Childs).	
	ton.	cwt.	ton.	cwt.	ton.	cwt.	ton.	cwt.	ton.	cwt.	ton.	cwt.
Florence wheat...	8	0	4	19	12	0	6	3	14	11	6	12
Firbank ,, ...	8	0	3	5	9	14	....		10	6	4	13
Buddah oats ...	13	6	6	9	17	8	15	19	17	0	8	5
Sunrise ,, ...	12	11	6	9	17	8	14	5	17	9	10	9
Algerian ,, ...	14	11	4	19	18	11	14	17	16	6	12	2

A combination crop of wheat and vetches at Kangaroo Valley yielded 15 tons 1 cwt. per acre, as compared with a yield of 10 tons 6 cwt. from wheat alone. This is in keeping with the results of previous years, and not only does the addition of vetches give a bulkier yield, but the feeding value is enhanced. Where the seed is broadcasted, about 20 to 30 lb. vetch seed per acre has proved satisfactory.

In conjunction with last season's tests, lime in different forms (burnt shell, ground shell and ground limestone) was applied to test plots at the rate of 4 cwt. per acre to ascertain if beneficial to yields. The lime, it is considered, was applied too close to sowing time to have any effect on last season's crops, but observations will be made on subsequent crops sown on the limed areas and reports will be awaited with interest. The burnt shell for the trials was donated by Messrs. Kelly Brothers, Burrell Lake, Ulladulla; the ground shell by the Shellharbour Shell Lime Company, Shellharbour; and the ground limestone by the Commonwealth Portland Cement Company, Sydney.

Fallowing in the Riverina.

Competitions at Yerong Creek, Osborne Creek and Munyabla.

G. C. BARTLETT, H.D.A., Senior Agricultural Instructor.

Owing to adverse seasonal and financial conditions, fewer fallow competitions were conducted and the number of entries was smaller this year than previously. Only three districts conducted competitions in the Riverina, these being Yerong Creek, Osborne Creek and Munyabla, the competition in each case being organised by the local branch of the Agricultural Bureau.

Early Ploughing and Judicious Cultivation Showed to Advantage.

Summer and autumn conditions were very dry and only one opportunity occurred to work the fallows after the new year. Many of the entries were ploughed on the late side and these appeared to have dried out rapidly, while the early-ploughed (June-July) areas showed to advantage as regards soil texture, seed-bed and moisture content. The time of the first working had also an influence in these respects. Not one good seed-bed was seen where the first working of the fallow had been delayed until after harvest. In other years under more favourable autumn conditions this has not been so outstanding, but the fallows were all judged under dry conditions and great variation was apparent. Several of the areas which had not been worked prior to harvest presented problems to the owners at the time of the completion of judging, which was the second week in April. They could not be further worked or sown until heavy rain fell, while the fallows worked early, such as that submitted by Mr. McMillan, had an excellent seed-bed and almost enough moisture to germinate a crop.

In the eastern districts the harrows need to be used with a great deal of discretion. They are a cheap and rapid means of working the land, but in many cases do not do the class of work that suits the soils. Frequently the cultivation is too shallow and the surface made too fine, resulting in the surface setting after rain and necessitating further working with a broad-tined implement. The best fallows noticed during recent years have been those that have been worked once or twice with broad tines. These operations individually are heavier and more costly, but they bring about a desirable state of tilth and render the frequent cultivation of the land unnecessary.

During recent years the cost of working fallows has received consideration in relation to efficiency, and it has been deemed that the frequent working of the soil is neither desirable nor necessary; but it has also been deemed essential in the interests of payable results that the land receive sufficient judicious workings, consisting of an early and moderately deep ploughing and a thorough spring cultivation, followed by one or more cultivations during the summer months.

On one or two fallows striking demonstrations were seen of the difference between a portion that had been cultivated after the January rain and a portion that was not. In the cultivated portion the seed-bed and moisture content were satisfactory and in the uncultivated portion the fallow was hard and dry to a depth of 9 inches.

Details of the Competitions.

Yerong Creek.—There were seven entries, and the competition was won by Mr. R. McRory with 138 points out of a possible 150. This block was a red loam which was mouldboard ploughed in June, harrowed in August, and springtoothed in October.

Osborne Creek.—There were sixteen entries in this competition, which was won by Mr. A. McMillan with 143 points. This block was also a red loam which was mouldboard ploughed in June-July, harrowed and springtoothed in October, and springtoothed again in February. This fallow, although it only had but two workings, was in almost perfect condition.

Munyabla.—This competition was won by Mr. W. J. Scott with 140 points; there were ten entries. The winning entry was a brown to red loam which was last under oats; mouldboard ploughed in July, springtoothed in October and again in January.

Absence of Green Feed Causes Trouble Among Pregnant Ewes.

The persistent dry weather recently has had the usual result in bringing about mortalities from dietetic causes. In many parts of the State the sheep have for months past been subsisting on dry grass and trefoil and other seeds, with very little green growing feed of any description. This state of affairs has had a serious result, particularly on pregnant ewes, and mortalities from what is generally known as preparturient toxaemia have been occurring. It has been noted, writes the Chief Veterinary Surgeon (Mr. Max Henry), that in endeavouring to protect against these mortalities food of a highly nitrogenous nature has been supplied, but it is questionable whether this is desirable. The sheep are weak and are not in a fit condition to assimilate and deal with large quantities of protein. Experimental work has shown that maize and oaten hay are both valuable for the maintenance of starving stock. In country which carries a heavy herbage crop the seeds from these plants will themselves provide a fair quantity of nitrogenous material, and supplements to such feed should tend rather to the carbohydrate content than to the protein content.

The consumer in England, writes Mr. J. W. Ferguson in the London "Fruit-grower," can be assured that those interested in the export of fruit from New South Wales are fully seized with the wisdom of sending only best qualities overseas; indeed, it is only good quality which will, in the long run, repay the costs incurred.

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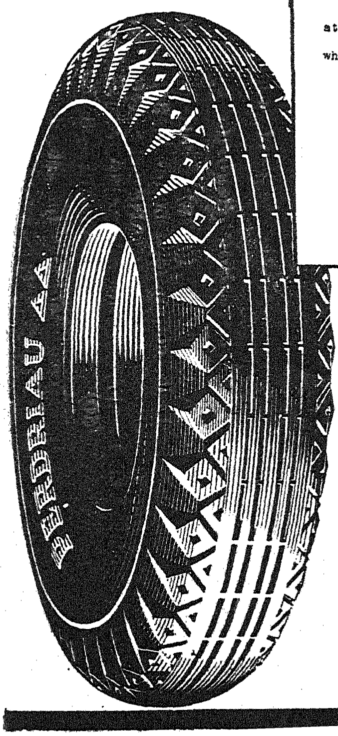

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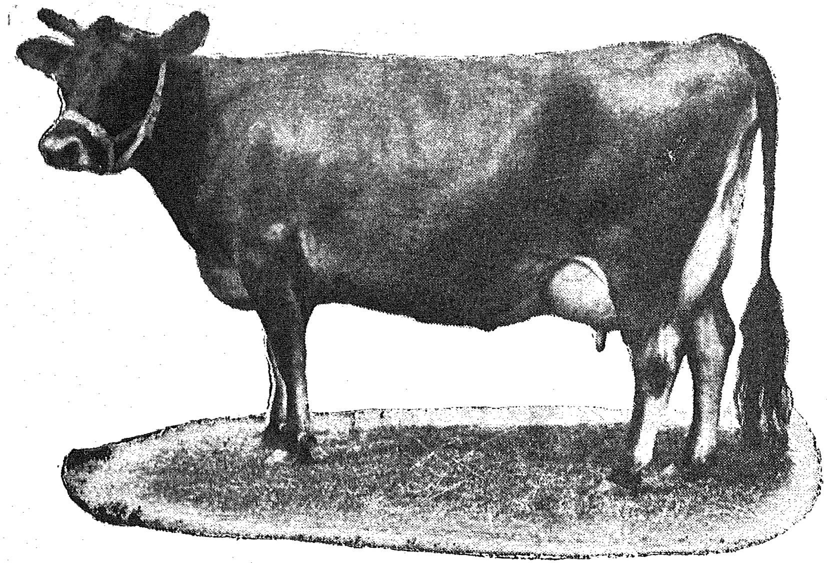


LADY TRENTON IV OF BATHURST (14083).

The following are the Herd-testing Records of some of the Cows in Departmental Herds:—

Jersey Cow: WAGGA GLADYS (7778). This cow holds a world's record for butter production for the Jersey breed—22,847 lb. milk, 1,517 lb. commercial butter in 365 days. Awarded Champion Ribbon, Peter's Prize, R. A. Show, 1928. *Guernsey Cow:* WOLLONGBAR PARSON'S RED ROSE 20th (730). Holds a world's record for butter production for the Guernsey breed—17,252.5 lb. milk, 1,302.62 lb. commercial butter in 365 days. *Ayrshire Cow:* MISS DOT OF GLEN INNES (3760)—19,562.5 lb. milk. 1,088.64 lb. commercial butter in 365 days.

The Department has for sale young bulls from tested dams of the following breeds:—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

For further particulars apply to—The UNDER SECRETARY, Department of Agriculture, SYDNEY.

Coonabarabran-Mudgee Farmers Should Fallow.

Competitions Indicate Scant Interest.

G. NICHOLSON, H.D.A., Senior Agricultural Instructor.

Fallowing in the true sense of the word is a little known practice in the Coonabarabran-Mudgee district. A favourable climate, diversified farming, and also in recent years the economic position, have not been conducive to a universal acceptance of improved cultural methods. Wheat growers in the older farming areas rely principally on pasture lands that have been ploughed to produce productive crops, and in the newer farming areas the fertile virgin soils have responded to but scant cultivation. Such methods, however, can only be successful whilst the area under crop is limited, or additional new land is available. Under the present circumstances it is not surprising that little interest was evinced in the district in fallow competitions this season. Coonabarabran was the only agricultural society to conduct a competition, and although the number of entries was not large it is pleasing to record that 75 per cent. were winter fallows.

The Season was Suitable.

The soil was in good order for ploughing during the winter. August was somewhat less favourable, but the heavy September rains provided a good opportunity for late fallowing, or for cultivating the fallows commenced earlier in the year. No further heavy rain fell until January. This was most useful in assisting in the consolidation of the seed-bed. Failure to cultivate after the January rains resulted in the ruination of those fallows by a prolific growth of stink grass (*Eragrostis major*). The rains which fell during late March and early April encouraged rapid germination of weed seeds and by the middle of the month seed-beds of intelligently prepared fallows were in most satisfactory order for sowing.

Efficient Working is Essential to Control Stink Grass.

One of the chief objections to winter fallow is the difficulty of controlling the growth of stink grass which invariably occurs in a season of good summer rainfall. Fallows which become infested with this weed seldom yield as well as crops grown on short fallow. Since in this district the principal objectives of fallowing are the formation of a suitable seed-bed and the control of weeds and disease, it is inadvisable to fallow a large area that cannot conveniently and expeditiously be cultivated at any time when circumstances warrant it during the summer months.

A practice that has proved highly satisfactory, both from a farming and grazing standpoint, is to sow oats on suitable ground in March or April for grazing, and to plough in the residues prior to harvest. This assists in

maintaining the humus content, and to some extent checks early growth of summer weeds. Moreover, on couch-infested country this system is preferable to long fallow.

Details of the Winning Entry at Coonabarabran.

Mr. T. Samson, of Purlewaugh, filled first place in the Coonabarabran competition with a fallow of dark chocolate, heavy, friable loam overlying a retentive subsoil at 4 to 6 inches. The paddock, which has been under cultivation for ten years was disc-ploughed 4 inches deep shortly after the September rains, springtooth cultivated in January (after rain) and again at the end of February. Cultivation had been performed with commendable thoroughness and care, and the result was a fallow with a nice uniform mulch with no trace of harshness. Compactness of the seed-bed was satisfactory and moisture content excellent.

To Keep Weevils Out of Stored Skins.

When skins are to be stored some time, especially in the summer months, it is advisable, as soon as possible after they have cooled off, to paint the pelts with some solution to keep away weevils and other pests, which do considerable damage by eating into them, thus reducing their value. Once the weevils get into the skin it is a difficult matter to remove them, and the longer they remain the more damage they do. Care must be taken to paint the pelt thoroughly, as unless this is done the weevils get in at the points and in small pockets and soon riddle the whole piece.

Cheap and effective mixtures for this purpose are made up as follows:—

1. Arsenic, 4 oz.
   Soda crystals, 8 oz.
   Water, 1 gallon.

Boil all together until dissolved, and when cool apply with a soft brush.

2. Arsenic, ½ lb.
   Soda, ½ lb.
   Water, 1 gallon.

Boil for half an hour.

3. Arsenate of soda, 1 lb.
   Water, 4 gallons.

Boil together.

4. Soda ash, 5 lb.
   Barbadoes aloes, ¼ lb.
   Water, 4 gallons.

Boil together, and when the mixture rises pour in 1 gallon of cold water. One part of this stock solution to five parts of water would be the proportions to use when required.

A Warning.—All of these mixtures are highly poisonous, and must be legibly branded as such. When not in use keep under lock and key.

These mixtures are also used for painting dry hides and all descriptions of marsupial skins. Paint the pelts with the solution, using an ordinary whitewash brush. Be careful to see that the pelts are thoroughly dry before bundling, as wet skins soon go mouldy and depreciate in value.

Pig Raising on the Wheat Farm.*

Mr. A. S. Harnett, of Quandialla, Considers Them a Profitable Sideline.

Mr. A. S. Harnett, of Quandialla, has found in pig-raising a profitable side-line to wheat growing. Not only can pigs be utilised to turn to profit the cracked grain from the header and all low grade wheat produced, but at harvest time, if allowed to forage in the stubble, they will find enough fallen heads and scattered grain to "pay for their keep." And there is many a time when portion of a lodged crop would be lost were it not for the pigs. It has also been found profitable to convert old sheep into pork and bacon by feeding them to pigs.

Furthermore, wheat has been proved the equal to maize as a feed for pigs, and it has the added advantage of being cheaper.

My experience has been that pig-raising is certainly a profitable side-line for the wheat-grower, even if he only has a dozen or so pigs, as a means of consuming cracked grain, etc., from the header (instead of sending it to the silo), and also for utilising gradings from seed wheat, along with other waste products on the farm and home. It is regrettable, but none the less a fact, that there is far too much waste on the average farm, much of which could be utilised for pork production.

My earliest methods of feeding and fattening were to allow the pigs to run on a grazing area and feed them whole grain twice a day, confining them to pens for a month when topping off for market. After selling my first consignment I bought a grain grinder, and since then have fed on ground grain, thus effecting a saving of fully 25 per cent. as against the feeding of whole grain. For those who keep or anticipate keeping only a few pigs it may not pay to purchase a grinder, but I think this could be overcome by the purchase of a grinder on a community basis, as there is just as big a saving in feeding ground grain (be it wheat, barley or oats) to large stock as there is to pigs.

Is Wheat Suitable for Pigs?

In this connection the results of an experiment which was commenced at Hawkesbury Agricultural College on 31st May, 1930, to compare wheat with maize as a feed for pigs from time of weaning until they reached the porker stage, are of interest. This experiment was fully reported in the *Agricultural Gazette* of January, 1932, but a summary of the findings are worthy of repetition.

Four litters were used in this experiment, each being halved, and one half fed on wheat and separated milk and the other half on maize and separated milk, green feed being fed to both lots. The method of feeding

* From a paper read by Mr. Harnett at the annual conference of the South-western Agricultural Bureau branches.

was that adopted in piggeries where labour is at a premium, viz., the wheat and maize were fed dry and untreated. The prices accepted for the various ingredients of the ration were: Wheat 2s. 3d. and maize 4s. a bushel, with green feed at £1 per ton.

From a litter of pigs by a Berkshire boar from a Tamworth sow the following results were obtained, which go to show conclusively that wheat, even when fed whole, pays:—

Five wheat-fed pigs when slaughtered, weighed	460 lb.
Five maize-fed pigs when slaughtered, weighed	413 lb.
Leaving the wheat-fed pen heavier by	47 lb.
Wheat fed to produce 1 lb. of gain was	9·531 lb.
Maize fed to produce 1 lb. of gain was	10·225 lb.
Cost of 1 lb. of wheat was	0·267d.
Cost of 1 lb. of maize was	0·362d.
Cost of 1 lb. of gain with wheat fed was	2·544d.
Cost of 1 lb. of gain with maize fed was	3·702d.
Profit on wheat-fed pigs per pound was	1·435d.
Profit on maize-fed pigs per pound was	0·729d.

The report goes on to say that the wheat-fed pigs when slaughtered showed in every case a flesh of good and fine grain, with fat and bone good, whilst the maize-fed pen showed a coarser grain, with a soft and, in one case, oily fat, with bone from somewhat soft to soft and in only one case good.

In every case comparing half litters of similar breeding, the wheat-fed pigs gave a greater gain per pound of feed than did the maize-fed pigs, and the cost per pound was in favour of wheat.

Observations on assimilation of rations showed that maize was more completely digested than wheat.

Whole wheat dry was found to be perhaps not the most economical method of feeding wheat to pigs.

Throughout the test the pigs could be differentiated by the excellent bloom of those fed on the maize and evenness of conformation of those on the wheat ration, though the difference was not marked at any time.

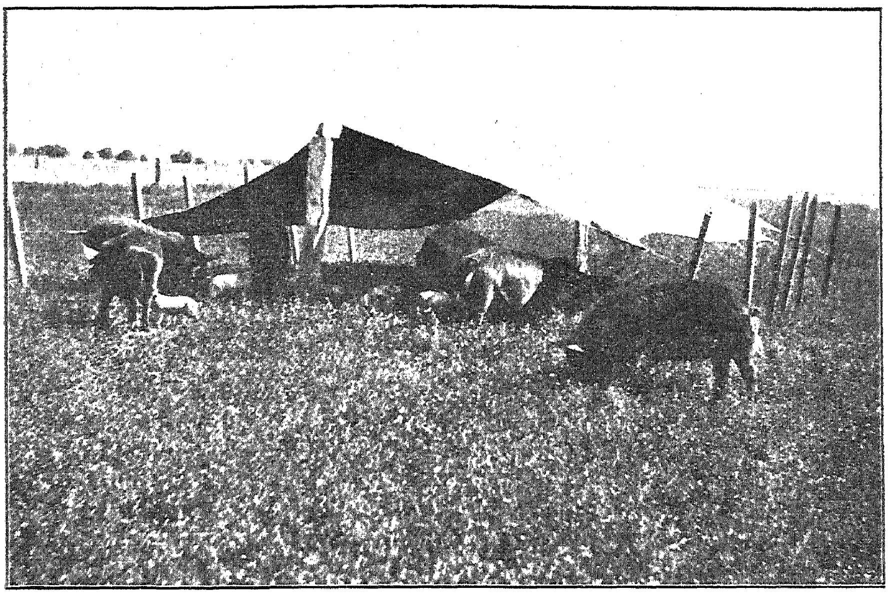
To generalise, the experiment would seem to produce sufficient evidence to show that wheat can be properly utilised as a pig food and that it is quite equal to maize.

Turning Old Sheep Into Pork.

The problem of profitably disposing of old sheep has been causing farmers some concern lately, and it seems to me that the pig suggests a way out. Slaughter and boil them down, and convert them into pork and bacon by feeding them to pigs. I recently bought old comeback and crossbred sheep shorn in August and September at 1s. a head, and am slaughtering and boiling them down for pig feed, and of course have the skins to sell. I am feeding the meat in the form of a soup to which is added 2 to 4 lb. of crushed grain to 1 gallon of soup, although the meat ration can be increased as the pigs become thoroughly accustomed to it. The addition of a meat diet has been found to produce remarkable qualities in the suckers born,

and in recent experiments none of the sows on a meat diet produced a single still-born sucker or a runt. When 1 lb. of meat was fed to the sow to every 30 lb. of grain, as compared with grain alone, the increase in the weight of the sucker at birth was from 1.74 lb. to 2.01 lb., and when proportionately four times as much meat was fed the increase of weight was from 1.74 lb. to 2.23 lb. The meat should be thoroughly boiled to a soup.

On the wheat farm, especially after harvest, pigs cost practically nothing to feed, as they may be allowed to forage among the stubble for themselves, cleaning up fallen heads of wheat and scattered grains. During the past two years I have had crops go down which, had it not been for pigs, would have been a considerable loss.



Pigs Grazing a Sown Pasture.

The idea of a temporary structure for shade is worth noting. It can be shifted about from one place to another.

My method of feeding wheat is first to grind it fairly finely and leave it overnight well covered with water, using this for the following day's feed. It is advisable to soak only sufficient overnight for the following day, especially in the summer time, as fermentation is likely to take place if the weather is hot.

A lucerne patch is a considerable help to the pig raiser, and the same, of course, applies to any leguminous plant.

There is no doubt about the advantages of grazing. Good nourishing grasses and clovers are very suitable for growing pigs, making a good frame and assisting in the development of a hard vigorous constitution and helping in the production of a rich-flavoured class of meat. But it is absolutely necessary to top the pigs off on grain for about a month or six weeks prior to marketing.

A good water supply is essential, and in the summer months a wallowing place and plenty of shade should be available to them. Pigs like to have their own way, and if shade and water are available to them they know how to use them to best advantage.

Plenty of bedding should be available to them, especially in the winter time, and the floor of the sty, if only of earth, should be the highest portion of the pen.

Pigs are very partial to charcoal; it helps to keep them in good health, and a bucket or two of this with ashes won't go amiss. Limewater (made by adding one part of lime to eight of water) is also beneficial to pigs (young ones), and can be added to the food at the rate of 1 pint to 4 gallons.

The Tamworth–Berkshire Cross Favoured.

The most suitable type of pig to raise in the wheat districts appears to me to be the Tamworth-Berkshire cross. The Berkshire is a good dual-purpose pig for use either as a baconer or a porker. It is quick-maturing, hardy, unaffected greatly by varying climatic conditions, and is a good breed for general use. The Tamworth is a pig of robust and strong constitution and very suitable for grazing conditions. They have good length and depth of body and other bacon qualities, which make them very much favoured for cross-breeding purposes, particularly when mated with the Berkshire.

Other breeds are the Middle Yorkshire, Large Yorkshire, Poland China, Duroc Jersey, Gloucester Old Spot, and British Large Black, but at present at any rate the Tamworth-Berkshire cross appears to be the most suitable all-round type. The progeny of this cross, when allowed free range, are good foragers, although the pure Berkshire is not so fond of foraging for itself, and therefore the desire for the cross is all the greater.

In making the selection of brood sows procure always from a reliable breeder, and select a sow that shows good length of body combined with well-sprung ribs, deep sides, and a good girth, which allows plenty of room for heart and lung action. It is not advisable to mate the sow until she is at least nine months old, and don't condemn a sow if she fails to have a large litter the first time, as this is not always an indication of the size of future litters. A sow can be retained as long as she is a satisfactory producer, which is usually about seven years.

The boar should come from a large litter, and should be purchased from a reliable breeder. The boar should be more on the compact side than the sow and show good development at every point, with rather short or medium long legs and bone of fair size. The boar should always be handled quietly and kindly.

Suckers should remain with the sow till they are eight weeks old, and it is a good idea to leave the smallest two of the litter with the sow for a day or so longer, or else let the sow have access to the whole litter for an hour or two for a couple of days. This is generally sufficient, although if the sow is a heavy milker it may be necessary to let her have access to the young ones for the third or fourth day. If pasture or green crops are avail-

able the young ones will do well on it along with the addition of well-soaked grain. Wood ashes, cinders, and a piece of rock salt should be available to them. Under normal conditions young Tamworth-Berkshire cross pigs can be marketed when six months old, and at this age should weigh from 100 to 130 lb. The ideal baconer, to my mind, appears to be one weighing not more than 120 lb.

Dull Markets, but Still a Profit.

Although our local markets are on the dull side at the present time, due among other causes, no doubt, to the low prices ruling for beef and mutton, there is still to my mind a fair margin of profit in pig-raising, especially taking into consideration the low prices ruling for all grain, and pigs will thrive on barley or oats as well as wheat, but to get the maximum food value from these, and especially oats, they should be ground.

The overseas market is attracting the attention of those interested in pork and bacon production in Australia, and it is of interest to note that the New South Wales Committee of the Australian Pig Council recently approved of the inclusion of pigs within the sphere of the proposed Australian Meat Export Council under the following conditions:—

(*a*) That there be two representatives of each of the three principal States on the State Committee and one representative each from the three principal States on the Federal Committee, and that they be elected by the producers.

(*b*) That the power to vote be restricted to those that grow or fatten not fewer than fifty pigs a year.

(*c*) That a levy be made on all pigs slaughtered in the Commonwealth in order to pay a bounty on all pork and pork products exported, or, failing this, that the bill provide for a bounty to assist and encourage export.

It behoves exporters and intending exporters to study the requirements of our overseas customers, and it is only by taking steps to fill these requirements that we can hope to develop a profitable export trade, and at a time such as we have been, and still are, passing through, I think it is up to primary producers to explore every revenue-producing avenue, and I trust that in doing so the humble porker will not be overlooked.

Annual State Conference of the Agricultural Bureau.

The State Conference of the Agricultural Bureau will take place at Hawkesbury Agricultural College, Richmond, on 25th to 28th July. Everybody—farmers and the general public, as well as members of the Bureau—are invited to be present, although it will be readily realised that preference must be given to members of the movement when allotting accommodation at the College. The charge for accommodation is only nominal. Full details concerning the arrangements can be had from the Secretary, Advisory Council of the Agricultural Bureau, Department of Agriculture, Box 36A, G.P.O., Sydney.

Registered Farm Produce Agents.

Official List.

The following is a list of farm produce agents who had registered with the Department of Agriculture at 1st April, 1933. Where not otherwise mentioned the address in each instance is Sydney :—

Agent.	*Address.*
Ah Kee, George (Yocksui Bros.)	4 Ultimo-road.
Allen, Archie Neathway (Bart Allen and Sons) ...	City Fruit Markets.
Allen, Stanley Victor	City Fruit Markets.
Archbold, Richard Ernest (Archbold Bros.)	City Fruit Markets.
Australian Fruit and Produce Co. Ltd.	6 Ultimo-road.
Bailey, Henry Gordon (W. Bailey and Sons)... ...	Campbell-street, Singleton.
Bailey, Robert Lester (W. Bailey and Sons) ...	Campbell-street, Singleton.
Banana Growers Co-op. Co. (N.S.W.) Ltd.	21 Lackey-street.
Beard, Alfred George	City Fruit Markets.
Bell, John (M. Walters and Co.)	City Markets, Fraser-street.
Bennett, James Thompson (Roberts, Reid and Co.)	9 Municipal Poultry Markets.
Bidner, William Charles (Bidner Bros.)	Pultney-street, Taree.
Billett, Edward John	City Fruit Markets.
Black, Roy Everett (H. Black and Sons)	City Fruit Markets.
Bourke, Arthur Henry (N. G. Bruce)	139 Sussex-street.
Bragg, Ronald Clive	City Markets, Fraser-street.
Brailey, Henry John (W. Constantine)	City Vegetable Markets.
Broadbent, Robert Joseph	21 Lackey-street.
Bromley, William Ernest	City Fruit Markets.
Brown, James Patrick (E. Wood and Co.)	6 Municipal Poultry Markets.
Brown, Reginald James (R. J. Brown and Son) ...	18 Quay-street.
Browne, Charles Percy (Chas. P. Browne and Co.) ...	123 Sussex-street.
Browne, Percy Robert Easton (Chas. P. Browne and Co.)	123 Sussex-street.
Bruce, Norman George (N. G. Bruce)	139 Sussex-street.
Buhl, Frank John (F. Buhl and Son)	City Fruit Markets.
Burke, J. and Sons Ltd.	King and Steele streets, Newcastle.
Caines, William Charles	Steam-street, West Maitland.
Cameron and McFadyen Ltd.	143 Sussex-street.
Carroll, Edward Charles (F. Carroll and Son) ...	City Vegetable Markets.
Carter, John Henry (Boot and Carter)	12 Ultimo-road.
Carter, Reginald Hollier	Dean-street, Albury.
Castley, Arthur Henry (Kerridge and McMahon) ...	171 Sussex-street.
Cates, Ernest Stanley	City Fruit Markets.
Chalmers, George Campbell (McDonald and Hynes)	Prince-street, Grafton.
Chilton, Fred	City Fruit Markets.
Chong, Mar Kee (Sun Lee and Co.)	96 Hay-street.
Clark, Stephen (Clark and Lochhead)	Kelly-street, Scone.
Clarke, Harold Rupert	City Vegetable Markets.
Clarke, Hector Manfred	City Vegetable Markets.
Clayton, James	City Vegetable Markets.
Clutton, Eric John	City Fruit Markets.
Comino Bros. (Sydney) Ltd.	23 Quay-street.
Committee of Direction of Fruit Marketing	3 Ultimo-road.
Commonwealth Fruit and Produce Co. Ltd. ...	City Fruit Markets.
Connell, Charles Dunstan (B. P. B. and Co.) ...	City Vegetable Markets.
Cook, Alfred Charles (J. and G. Roughley)	City Markets, Fraser-street.
Cooke, Edwin	City Vegetable Markets.
Cooper, Alfred John	City Fruit Markets.

Agent.	Address.
Cottee, Charles Henry George	City Fruit Markets.
Cowell, Richard Muir (Richard Cowell and Co.) ...	City Fruit Markets.
Craig, Walter Sydney (A. Mason and Co.)	City Markets, Fraser-street.
Cramp, Herbert Richard	City Fruit Markets.
Crowder, Arthur Beaumont (Thiessen and Crowder)	City Fruit Markets.
Curtis, Wallace Jenkins (W. J. Curtis)	City Vegetable Markets.
Davis, Arthur Garnet (Davis Bros.)	Doyle-street, Narrabri.
Davis, Edwin George (Davis Bros.)	Doyle-street, Narrabri.
Dening, Augustus (Dening Bros.)	City Vegetable Markets.
Dening, Charles (Dening Bros.)	City Vegetable Markets.
Dening, Seymour	City Vegetable Markets.
Derrick, Phillip	City Vegetable Markets.
Dickson, Frederick George	City Vegetable Markets.
Doust, Charles Brissenden (Doust and Rabbidge) ...	348 Sussex-street.
Drane, William (Hanigan and Drane)	City Vegetable Markets.
Drew, Harrie (Drew, Brown and Drew)	197 Sussex-street.
Dundon, Frederick Christian	City Markets, Fraser-street.
Dunston, Bertram	City Fruit Markets.
Dunston, Harry Francis (Dunston and Norris) ...	City Vegetable Markets.
Evans, Eric (Evans and Gray)	City Vegetable Markets.
Ewen, Harry Lot James (Ewen and Sons)	City Fruit Markets.
Fear, Hugh Rainor (Fear and Paulin)	City Fruit Markets.
Firth, Alfred (Stimson and Firth)	City Markets, Fraser-street.
Fisher S. K. Ltd.	7 Quay-street.
Foley Bros. Ltd.	355 Sussex-street.
Foster, Alfred Ernest	City Fruit Markets.
Fox, Henry Vincent	City Vegetable Markets.
Francis, William (Bart Allen and Son)	City Fruit Markets.
Fry, Horace Charles (Lord and Fry)	King-street, Newcastle.
Galvin, William Francis (Mitchell and Galvin) ...	City Vegetable Markets.
Garrett, T. and Sons Ltd. (H. Laverty and Co.) ...	Steele-street, Newcastle.
Gibbs, Arthur Herbert (C. Gibbs and Son)	City Markets, Fraser-street.
Ginn, George Herbert	City Fruit Markets.
Gittins, Reece Edward (Gittins and Eastham) ...	Steele-street, Newcastle.
Gock, Shir King (Wing Chong and Coy.)	98 Hay-street.
Goodfellow, James (Goodfellow's Auction Mart) ...	Bowral.
Graham, Douglas Gordon (N. S. Graham)	City Fruit Markets.
Graham, Lisle Henry	City Vegetable Markets.
Grainger and Falkiner Ltd.	John-street, Singleton.
Gray, George (Evans and Gray)	City Vegetable Markets.
Gray, Robert Francis (Robert Robinson and Co.) ...	145 Sussex-street.
Greenberg, Myer (S. and M. Greenberg)	20 Lackey-street.
Greentree, Albert Charles (H. J. Greentree)	City Fruit Markets.
Greentree, Clendon Copeland (C. C. Greentree and Son).	City Vegetable Markets.
Greentree, Herbert James (H. J. Greentree) ...	City Fruit Markets.
Hacking, Emanuel (Buhl and Hacking)	City Fruit Markets.
Hallaran, Cecil Ernest (W. J. Curtis)	City Vegetable Markets.
Hanigan, Frederick Charles (Hanigan and Drane) ...	City Vegetable Markets.
Harder, William Henry (Sherwood and Harder) ...	City Fruit Markets.
Harrington, George Albert Edward	City Fruit Markets.
Harris, Arthur Henry	City Fruit Markets.
Harris, Cecil Edgar (Walter Harris)	City Fruit Markets.
Harris, John Frederick (E. Wood and Co.)	6 Municipal Poultry Markets.
Hawke and Treloar Ltd.	Gunnedah.
Hawke, John Henry (J. Hawke)	5 Ultimo-road.
Hay, Emerson (Hay Bros.)	City Fruit Markets.
Hay, Leslie Seaton (Hay Bros.)	City Fruit Markets.

Agent.	*Address.*
Hayes, Sydney Paul (Hayes and Co.)	196 Sussex-street.
Heiner, Jacob William	City Fruit Markets.
High, Devaney William (D. G. High and Son) ...	City Fruit Markets.
Hilbery, Reginald William	City Vegetable Markets.
Hill, Francis William	City Fruit Markets.
Hing, Albert (Hie Lee and Co.)	92 Hay-street.
Holmes, J. Ltd.	City Fruit Markets.
Hooke, Robert Lloyd Everard (Reg. Swan)	Steele-street, Newcastle.
Hop Lee and Co. Ltd.	8–9 Municipal Buildings, Ultimo-road.
Hoskisson, Norman	City Fruit Markets.
Howard, Alfred Alexander	City Markets, Fraser-street.
Howard, Frederick Ellis (B. P. B. and Co.)	City Vegetable Markets.
Hunter, James Wentworth (Hunter and Wild) ...	City Fruit Markets.
Jenkins, Ernest Aloysius (John Jenkins)	City Fruit Markets.
Jenkins, George Edward (John Jenkins)	City Fruit Markets.
Jenkins, John Albert (Jenkins and Londregan) ...	City Fruit Markets.
Jenkins, Leslie James (John Jenkins)	City Fruit Markets.
Johnson, John Malcolm	City Fruit Markets.
Johnston, Norman Oswald (Johnston and Tebbutt)	City Vegetable Markets.
Jolly, Melvyn Neil (Neil, Jolly and Co.)	City Fruit Markets.
Jones, Ben	Palm-avenue, Leeton.
Jones, J. and Co. Ltd.	191 Sussex-street.
Jones, Richmond Clyde	City Fruit Markets.
Jones, William Henry	Ward-lane, Mittagong.
Jones, William John	City Fruit Markets.
Jurd, Albert	City Markets, Fraser-street.
Kellaway, Christopher George (C. G. Kellaway and Son).	City Fruit Markets.
Kennedy, Francis Xavier (F. Kennedy and Sons) ...	12 Steam-street, West Maitland.
Kennett, Frederick Charles	City Fruit Markets.
Kent, Henry Patrick (Stevens and Co.)	Byron-street, Inverell.
Kerridge, Walter Platts (Kerridge and McMahon) ...	171 Sussex-street.
Kerwick, Michael Vincent (John Rankin and Co.) ...	199 Sussex-street.
Ki How, Samuel (Yocksui Bros.)	4 Ultimo-road.
Kirkwood, John William	Ultimo-road.
Langston, Desmond (Central Markets)	6 Brisbane-street, Tamworth.
Lawless, Ernest Albert (Mitchell and Lawless) ...	City Fruit Markets.
Lee Dow, Arthur	City Vegetable Markets.
Lee Fook, Edward (E. Lee Fook and Co.)	City Fruit Markets.
Leong, Hoy Ket (Sam Yick and Co.)	23 Lackey-street.
Leuckel, George	City Fruit Markets.
Liu, Charles (Wing Tiy and Co.)	94 Hay-street.
Lloyd, Allan Leslie (Moore and Lloyd)	City Fruit Markets.
Lochhead, George Neville (Clark and Lochhead) ...	Kelly-street, Scone.
Lockart, Hubert Clendon	City Fruit Markets.
Londregan, William Rodger (Jenkins and Londregan)	City Fruit Markets.
Lord, Henry (Lord and Fry)	King-street, Newcastle.
Lovell, John Patrick (A. Marantelli and Co.) ...	City Markets, Fraser-street.
Macdermott, Percy Style (Macdermott and Sheedy)...	City Fruit Markets.
Mackaness, James Vincent	171 Sussex-street.
Marsh, Andrew John (M. Walters and Co.)	City Markets, Fraser-street.
Marsh, Percy (Central Markets)	6 Brisbane-street, Tamworth.
Martin, Albert Henry (Martin and Co.)	City Fruit Markets.
Martin, Cyril Roy (Martin and Co.)	City Fruit Markets.
Martin, Leslie Albert (Martin and Co.)	City Fruit Markets.
Mason, Edward Allan (A. Mason and Co.)	City Markets, Fraser-street.
Mason, Joseph James	Ultimo-road.
McEnnally, Robert Morrow	City Fruit Markets.

Agent.	Address.
McHugh, T. Ltd.	103 Sussex-street.
McLachlan, Alban James (Arnold and McLachlan) ...	13 Ultimo-road.
McLeod, George Muir	City Fruit Markets.
McMahon, Edward David (Kerridge and McMahon)	171 Sussex-street.
Messent, Arthur Bertram (Messent and Tom) ...	City Vegetable Markets.
Middleton, Alexander Stein (Middleton and Mayo)...	City Fruit Markets.
Milne, Archibald Edwin Gordon (J. W. Bryant) ...	City Fruit Markets.
Mitchell, Herbert Henry (H. Mitchell and Son) ...	City Fruit Markets.
Mitchell, James Chenoweth (Mitchell Bros.) ...	21 Railway-crescent, Burwood.
Mitchell, Stanley Thomas Boyden (Mitchell and Galvin).	City Vegetable Markets.
Mitchell, Thomas Shapton	City Vegetable Markets.
Mobbs, William Ernest (Mobbs Bros.)	City Fruit Markets.
Molesworth, George Harrison	City Vegetable Markets.
Monks, Alfred James (Skudder and Monks)	Wagga Wagga.
Moore, Albert Edward (Moore and Lloyd)	City Fruit Markets.
Morris, John William	City Fruit Markets.
Morton, Philip Henry (Morton and Luke)	City Fruit Markets.
Moses, Walter John	City Vegetable Markets.
Moss, Joshua (J. Moss and Sons)	City Fruit Markets.
Murdoch, George, junior (Bidner Bros.)	Pultney-street, Taree.
Murray, Frederick Arthur	City Vegetable Markets.
Murray, Rollo McDonald (R. McDonald)	City Vegetable Markets.
Musgrove, Walter Matthew (W. Musgrove and Son)	City Fruit Markets.
Norris, Cecil Thomas (Dunston and Norris)	City Vegetable Markets.
North, George Maxfield	Isabella-street, Wingham.
O'Donoghoe, Eleanor (M. Walters and Co.)	City Markets, Fraser-street.
Orr, John	Lackey-street.
Oxby, William (Walker and Oxby)	153 Sussex-street.
Palmisano, Phillip Enrico	City Markets, Fraser-street.
Parker, Edward William (Parker and Son)	City Vegetable Markets.
Paulin, Thomas King (Fear and Paulin)	City Fruit Markets.
Peterson, Frank Christian	City Vegetable Markets.
Phillips, Alfred Daniel (Alf. Phillips and Co.) ...	121 Sussex-street.
Picone, Frank Domenico	City Fruit Markets.
Pogson, Stanley Hessel (Hopkins and Lipscombe) ...	City Fruit Markets.
Powell, Charles Allan	City Fruit Markets.
Prescott Ltd.	365 Sussex-street.
Producers Co-op. Distributing Society Ltd.	Quay and Valentine streets.
Quan Geen, Peter (Yocksui Bros.)	4 Ultimo-road.
Queensland Fruits Ltd....	13 Steele-street, Newcastle.
Quigley, Ernest	City Fruit Markets.
Rabbidge, Martin Edward (Doust and Rabbidge) ...	348 Sussex-street.
Ralph, Alexander William (J. and A. Ralph) ...	9 Darcy-street, Parramatta.
Ralph, James Herbert (J. and A. Ralph)	9 Darcy-street, Parramatta.
Rankin, John (John Rankin and Co.)	199 Sussex-street.
Rankin, Thomas Patrick (John Rankin and Co.) ...	199 Sussex-street.
Reedy, James Adrian (Reedy Bros.)	7 Ultimo-road.
Reedy, Patrick (Reedy Bros.)	7 Ultimo-road.
Rhodes, Sidney Joseph	City Vegetable Markets.
Ridge, Vincent	City Fruit Markets.
Roberts, Reginald John (Roberts, Reid and Co.) ...	9 Municipal Poultry Markets.
Rogers, Henry William Frederick	City Markets, Fraser-street.
Rogers, Keith Edward Vyvyan (F. H. G. Rogers) ...	City Fruit Markets.
Rose, John	Branxton.
Roughley, Oliver Edwin	City Markets, Fraser-street.
Roughley, William Garfield (J. and G. Roughley) ...	City Markets, Fraser-street.

Agent.	*Address.*
Sadler, Percy William (Watkins and Evans) ...	City Fruit Markets.
Salmon, F. J. and Co. Ltd.	City Fruit Markets.
Scaramuzzi, Carlo Pietro	City Fruit Markets.
Schuster, Alfred Edward	16 Quay-street.
Scott, Andrew (McKellar and Devlin)	City Fruit Markets.
Sheedy, Cecil Kenneth (Macdermott and Sheedy) ...	City Fruit Markets.
Sherringham, Edna May (Sherringham and Co.) ...	21 Quay-street.
Silk Bros. (Sydney) Ltd.	City Fruit Markets.
Sinclair, William James	78-84 Hay-street.
Skudder, John Herbert (Skudder and Monks) ...	Wagga Wagga.
Slater, Alfred (James Slater)	City Fruit Markets.
Small, Alick Oakes (A. O. Small and Son)	City Vegetable Markets.
Smith, Charles (Thompson and Smith)	City Vegetable Markets.
Smith, Leonard	City Fruit Markets.
Southcott, Henry Frederick (W. H. Southcott) ...	City Fruit Markets.
Southern Produce and Livestock Co. Ltd.	George-street, Parramatta.
Stanton, Ernest Thomas (E. T. Stanton)	City Fruit Markets.
Stassi, George	City Fruit Markets.
Steggles Ltd.	Steele-street, Newcastle West.
Stevens, Charles Frederick (F. G. Stevens and Sons)	City Fruit Markets.
Stevens, Hamilton (Stevens and Co.)	Byron-street, Inverell.
Stubbs, Ephraim Clement	11 Quay-street.
Sunnyside Orchards Ltd.	47 Hay-street.
Swan, Herbert Lancelot (Reg. Swan)	Steele-street, Newcastle.
Swan, Reginald Ernest (Reg. Swan)	Steele-street, Newcastle.
Swan, Murray and Hain Ltd.	Church-street, West Maitland.
Taylor, Clarence Raymond	City Vegetable Markets.
Terry, Alexander	City Fruit Markets.
Terry, Joshua	City Fruit Markets.
Thiessen, Noel David (Thiessen and Crowder) ...	City Fruit Markets.
Thompson, Harry Linden (Thompson and Smith) ...	City Vegetable Markets.
Trathen, James (Trathen and Hall)	City Fruit Markets.
Tuffin, Robert Henry	City Fruit Markets.
Tunks, Kenneth Sidney George	City Fruit Markets.
Turnbull, David Charles	City Fruit Markets.
Turnbull, Wilfred Ernest	City Fruit Markets.
Valentine, Ralph James (R. Valentine and Sons) ...	City Fruit Markets.
Valentine, Vivian Victor (R. Valentine and Sons) ...	City Fruit Markets.
Waddell, Albert William Augustus	City Fruit Markets.
Walker, Aaron Hilton	City Fruit Markets.
Walters, Harold Charles (Central Markets)	6 Brisbane-street, Tamworth.
Ward, Arthur Cecil (Ward and Felton)	City Fruit Markets.
Watkins, William Percy (Watkins and Evans) ...	City Fruit Markets.
Wilson, George Alfred	City Fruit Markets.
Wilson, Herbert	City Fruit Markets.
Wilson, Percy Edward (Wilson and Croucher) ...	City Fruit Markets.
Wilson, Sidney (Wilson Bros.)	City Fruit Markets.
Windows, Ernest (Windows and Caro)	City Fruit Markets.
Wing On and Co. Ltd.	Corner Ultimo-road and Quay-street.
Wing Sang and Co. Ltd.	Hay-street.
Wong Yong Tai (P. W. Chew and Co.)	2 Ultimo-road.
Wood, Ernest James (E. Wood and Co.)	6 Municipal Poultry Markets.
Woodcock, Elizabeth (J. A. Woodcock)	Steele-street, Newcastle.
Woodcock, John (A. E. Spurway)	City Markets, Fraser-street.
Woodcock, Walter (A. E. Spurway)	City Markets, Fraser-street.
Woolland, Walter	City Fruit Markets.
Yee, Arthur (Sun Lee and Co.)	96 Hay-street.
Yee, William (A. Lee and Co. and C. G. Williams) ...	City Vegetable Markets.
Yocksui Gee, William (Yocksui Bros.)	4 Ultimo-road.
Young, Charles Joe (Wing Tiy and Co.)	94 Hay-street.

Artificial Manure Subsidy.

Still Doubt Among Farmers as to Whom it Applies.

The subsidy, under the Commonwealth Relief Act, 1932, of 15s. a ton on all artificial manures actually used between 1st December, 1932, and 30th November, 1933, is payable to all primary producers other than wheat-growers. Special provision was, of course, made for the wheat-grower whereby he was paid a bounty on every acre planted last season. Thus the financial assistance in regard to the use of artificial manure applies in respect of every product except wheat. Producers of oats, barley, beans, apples, pears, citrus fruits, bananas, tobacco, etc., will all be eligible to claim the subsidy, which also applies to artificial manure used in top-dressing pastures.

Definition of the Term "Artificial Manure."

Artificial manure for the purposes of the Act is any substance which contains nitrogen, phosphoric acid or potash, and which has been manufactured, produced or prepared in any manner for the purpose of fertilising the soil or supplying nutriment to plants, but does not include any animal or vegetable matter which has not been subjected to process of manufacture. Lime does not come within the meaning of artificial manure for the purposes of the Act.

Applications for the subsidy must be made *in ink* by primary producers on a special form, and these applications will require to be completed by the primary producer and sent by him to the supplier of the artificial manure for his certificate, as provided on the form. The supplier will then send the application to the Fertiliser Subsidy Section of the Department of Commerce in the State in which the fertiliser has been used. New South Wales claims will be sent to the Secretary, Department of Commerce, Customs House, Sydney. Forms of application have been distributed to country post offices. Any primary producer who experiences difficulty in securing a form should communicate with the Department of Commerce, Customs House, Sydney, where a reserve supply of forms is held.

Make Only One Claim if Possible.

It will be noted that primary producers are not eligible to submit applications for the subsidy until they have actually used the artificial manure in regard to which they desire to claim financial assistance. They should use the full quantity of artificial manure which they intend to apply in regard to any particular product before submitting an application. They should not submit a claim in regard to a portion of the quantity used and then submit one or more claims in regard to the remainder. The Department of Commerce hopes that in most cases it will be necessary for only one claim to be made by a primary producer, but it is recognised that in special circumstances two claims may be necessary.

The declaration to be completed by applicants for the subsidy, as shown on the form of application, must be made in the presence of either a commissioner for declarations, a J.P., bank manager, postmaster, station-master, or constable or officer of the police force. No other official is authorised to take this declaration.

Primary producers are requested to exercise every care in completing their claims. All the particulars asked for on the form of application must be filled in by the applicant, otherwise delay will be caused in finalising the claim owing to the necessity of returning claims to primary producers for completion or correction.

Keep Your Horses free from Internal Parasites.

So common are internal parasites in horses that it is extremely rare to hold a post-mortem examination without finding some part of the stomach and bowels infested. As their presence adversely affects the health and condition of the animal, every endeavour should be made to keep it as free as possible from their attacks. Horse owners will get much help in this direct from a free leaflet—"Some Common Internal Parasites of the Horse"—issued by the Department of Agriculture, Box 36A, G.P.O., Sydney.

Outbreaks of Strangles Have Been Numerous.

The rising value of horses, particularly draughts, is again directing increased attention to their health. Outbreaks of strangles have been rather numerous, although, speaking generally, the disease is not occurring in a virulent form. Deaths, on the whole, have not been numerous, but such an outbreak has, naturally, a serious effect on the economic working of a holding, since it throws the horses off work for a considerable period. It is very desirable that they should be allowed to recover fully before being again subjected to heavy work, as otherwise in their weakened condition they would be liable to suffer from colic and other undesirable conditions.

A Booklet Every Sheepowner in Australia Should Have.

The booklet referred to is "The Sheep Blowfly Problem in Australia," published jointly by the New South Wales Department of Agriculture and the Council for Scientific and Industrial Research. It contains 130 pages of text, and the many illustrations include a coloured plate depicting the various species of blowfly, making it possible to identify any particular fly observed on the property.

The text contains much information about the blowflies themselves, such as every sheepowner should possess to enable him to understand the origin of the pest and the why and wherefore of many matters connected with strike. The several methods by which the pest can be combated are described in detail and their applicability discussed.

The price of the booklet is 1s. 6d., post free, and it is obtainable from the Department, Box 36A, G.P.O., Sydney.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Baringa	... H. J. Harley, "Wattle Park," Tullibigeal.
	A. M. M. Paterson, "Greenhills," Delungra.
Bobin	... Manager, Experiment Farm, Temora.
	H. J. Harvey, "Kindalin," Dubbo.
	D. W. Edis, "Prestonville," Ariah Park.
	E. J. Johnson, "Iona," Gunningbland.
	C. Condon, Box 9, The Rock.
	Cullen Bros., "Bunglegumbie," Dubbo.
Cleveland... ...	... W. Burns, "Goongirwarrie," Carcoar.
Federation ...	... C. Condon, Box 9, The Rock.
Ford	... C. Bennett, "Theole," Forbes-road, Cowra.
	J. B. White and Sons, Boggabri.
	A. D. Dunkley, "Bon Lea," Brundah, via Grenfell.
Nabawa	... David Bolte, "Lincluden," West Wyalong.
	G. T. S. Troy and Sons, "Fairfield," Quandialla.
	C. F. T. Anderson, "Swan Vale," via Glen Innes.
	H. J. Harley, "Wattle Park," Tullibigeal.
	E. J. Johnson, "Iona," Gunningbland.
	Cullen Bros., "Bunglegumbie," Dubbo.
	J. B. White and Sons, Boggabri.
Riverina	... Cullen Bros., "Bunglegumbie," Dubbo.
Waratah	... G. T. S. Troy and Sons, "Fairfield," Quandialla.
	E. J. Johnson, "Iona," Gunningbland.
	H. J. Harvey, "Kindalin," Dubbo.
	C. Condon, Box 9, The Rock.
	J. B. White and Sons, Boggabri.

Oats—

Buddah	... Manager, Experiment Farm, Cowra.
Burke	... Manager, Experiment Farm, Cowra.
Gidgee	... Manager, Experiment Farm, Cowra.
Kendall	... Manager, Experiment Farm, Cowra.
Laggan	... Manager, Experiment Farm, Cowra.
Mulga	... C. Bennett, "Theole," Forbes-road, Cowra.

Potato ("Certified" and "Standard" Seed)—

Carman	... Secretary, Potato Growers' Association, Bannister.
	Secretary, Potato Growers' Association, Millthorpe.
Early Carman ...	... Secretary, Potato Growers' Association, Millthorpe.
Early Manhattan	... Secretary, Potato Growers' Association, Millthorpe.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Factor	... Secretary, Potato Growers' Association, Bannister.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Batlow.
	Secretary, Potato Growers' Association, Millthorpe.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
	Secretary, Potato Growers' Association, Taralga.
Gold Coin ...	... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Late Manhattan	... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Queen of the Valley (Standard grade only.)	... Secretary, Potato Section, Rural Co-operative Society Ltd., Batlow.

Cauliflower—

Mitchell's No. 4 ...	... C. J. Rowcliff, Old Dubbo road, Dubbo.

Onion—

Hunter River Brown Spanish ...	... S. Redgrove, "Sandhill," Branxton.
	C. J. Rowcliff, Old Dubbo road, Dubbo.
Hunter River White Globe.	C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Improved Sunnybrook Earliana ...	... A. Sorby, Macquarie Fields.
Break-o'-Day ...	... A. Sorby, Macquarie Fields.

Pea—

Greenfeast ...	... P. Morandini, Bunglegumbie-road, Dubbo.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Fruits and Seeds of "Caper Spurge" are Poisonous.

The Director of the Botanic Gardens (Dr. G. P. Darnell-Smith) recently received from a correspondent specimens of the fruit of the naturalised weed "caper spurge" (*Euphorbia lathyris*) along with the query as to whether these were the true edible capers used for culinary purposes. The correspondent, of course, was unaware of the identity of the plant, but had observed, according to his letter, that the eyes of persons handling the plant had become affected and that after tasting the caper-like fruits a burning sensation in the throat was experienced accompanied by nausea.

In reply it was pointed out that the plant was in no way related to the true caper, and the correspondent was warned that both the fruits and seeds are poisonous.

Insect Pests of Tobacco.

[Continued from page 376].

T. McCARTHY, Senior Assistant Entomologist.

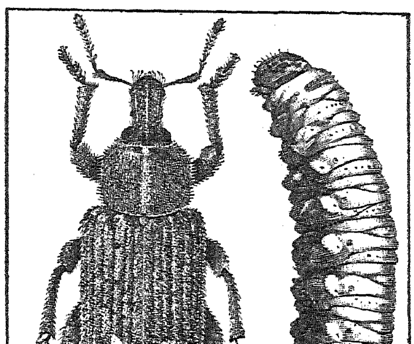
In our previous issue Mr. McCarthy dealt with the tobacco leaf-miner (*Phthorimæa operculella*)—perhaps the most serious pest of the seed bed—the tobacco budworm (*Heliothis obsoleta*) and cutworms (*Noctuidæ*). In this issue, which completes the article, are described and illustrated the tobacco elephant beetle (*Listroderes obliquus*) and thrips (*Anaphothrips striatus*). A useful summary of control measures for tobacco pests is also included.

Tobacco Elephant Beetle.

THE tobacco elephant beetle attacks a wide range of host plants and is much better known as the brown vegetable weevil because of its depredations in many vegetable crops.

When present in tobacco seed-beds it may cause considerable damage, particularly when the plants are comparatively small. Although damage may be caused by both the grub and adult weevil, the chief damage is caused by the latter, which is capable of inflicting rapid and serious injury to the plants.

The adult beetle is about ½ inch in length, rather elongate in shape, and in common with the rest of the weevil family has the head extended into a snout, at the extremity of which the jaws are situated. In colour it is greyish-brown, with two oblique, whitish patches, which form a roughly V-shaped mark on the upper surface. The eggs are deposited in the soil, and from these the minute larvae hatch. When fully grown the larvae are light yellow to pale green, legless grubs just under ½ inch in length. These larvae construct earthen cells in the soil, where they pupate, and later emerge as adult beetles.



Tobacco Elephant Beetle (Enlarged).
Left.—Adult.
Right.—Larva.

Feeding in the adult stage invariably occurs at night, the beetles sheltering during the day in the soil or under rubbish near the base of the plants. The grubs feed mainly at night, but have also been observed feeding during the day.

The grubs are present during autumn and winter and the adults begin to appear in August and September, becoming abundant in October and November, which is the period when they are most destructive.

The control of the tobacco elephant beetle may be effected by the use of an arsenate of lead spray or dust. As a spray 1 lb. of arsenate of lead to 30 gallons is recommended, and as a dust, arsenate of lead mixed with lime or kaolin to form a 25 per cent. dust may be used. Proprietary dusts are available and are more satisfactory than the home-made product.

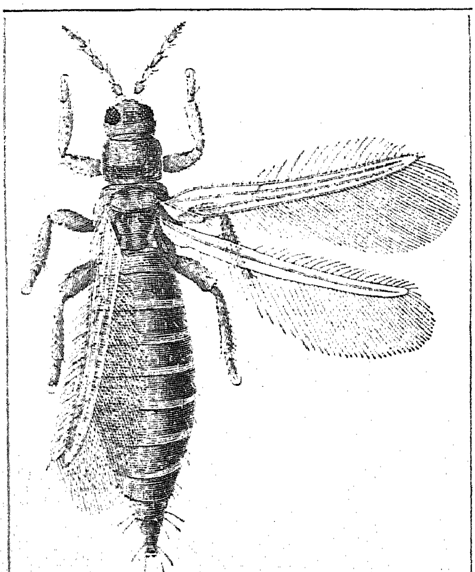
Where the plants are so small that the beetles may destroy most of the plants before being killed, poisoned vegetation is recommended. The beetles feed readily upon many other plants, and of these the common Cape weed is preferred. A quantity of the weed is dusted or sprayed with arsenate of lead, and the poisoned vegetation is scattered over the beds, preferably late in the day so that it will remain fresh at night when the beetles feed.

The bran and Paris green bait referred to in May issue as a control for cutworms may also be used for the control of this beetle.

Poisoned vegetation or poisoned bran may be used with some advantage just before the sowing of the seed or just prior to germination. The beds are then free of the pests when the young plants appear. The poisoned vegetation can be used on the bed at any time, but if the poisoned bran is used after the plants have appeared in the beds it should be scattered lightly or placed in pellets to avoid the burning of the young plants.

Tobacco Thrips.

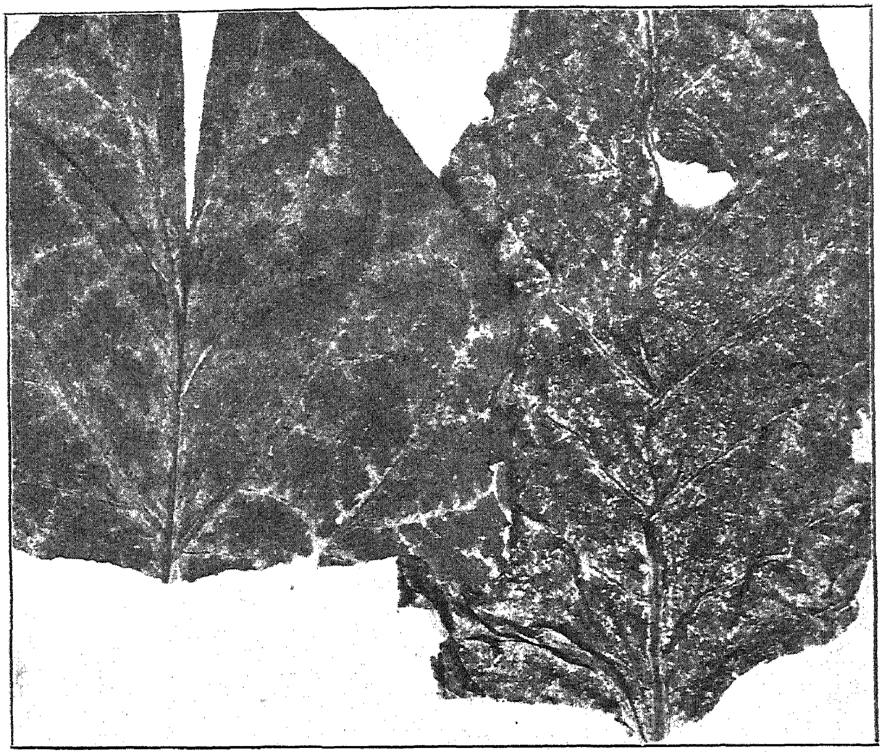
The tobacco thrips are minute insects which damage the leaf by rasping the surface and sucking up the sap. This causes the foliage to become mottled and discoloured before it has matured, retarding its growth, and considerably reducing, or even destroying its value. In addition, the leaves become covered with large quantities of excrement, which further reduces their value.



The Tobacco Thrip (*Anaphothrips striatus*).
[Much enlarged.]

When heavy infestations occur the damage may therefore be considerable, but, fortunately, the appearance of thrips in large numbers is not of annual occurrence, and this somewhat limits their importance as a pest. It is likely that in those areas where irrigation is necessary, thrips may cause more damage, for when all the grass and other natural herbage is destroyed by dry conditions, the tobacco may be the only green crop left for them to attack.

The thrips lay large numbers of their minute eggs, generally along the mid-rib and veins of the leaf, and as soon as the young thrips hatch they attack both surfaces of the leaf. At first the damage shows up as a yellowish mottling along the mid-rib and veins, but later the whole leaf may become similarly infested. The immature thrips are pure white in colour, but after passing through a number of moults they become adult, when they are yellowish in colour and have two pairs of delicate, fringed wings.



Tobacco Leaves Showing Damage Caused by Thrips.

Thrips can be more easily controlled when they are relatively few in number, and an early knowledge of their presence will enable control measures to be carried out before much damage has been done. In experimental work kerosene emulsion at a dilution of 1 gallon kerosene to 30 gallons of water (use ½ lb. soap to make the primary emulsion), has been found to be the most effective spray. It is important that a perfect emulsion should be made, as any free oil that may be present will burn the plants. The thorough application of the liquid to both upper and under surfaces of the leaves is also essential.

Summarised Control Measures for Tobacco Pests.

Summarised, the procedure to be followed by growers in the control of tobacco pests may be stated as follows:—

(1) Select the most suitable site for the seed-beds and destroy all plants or plant remains in the vicinity that are likely to serve as centres of infestation.

(2) Prepare the beds thoroughly. Do not plant too thickly and keep the plants growing vigorously so that they will be better able to resist insect attack.

(3) Burn over the beds before sowing; it will amply repay the trouble, as there is nothing like heat to kill insect life; start off with a seed-bed reasonably free from insect pests.

(4) Covering the seed-bed with straw is strongly to be deprecated, for not only does this type of cover harbour the usual pests, but it encourages all kinds of small ground insects, which, although not regular pests, are general feeders and destroy quite a large number of the young plants soon after they have germinated. It is therefore advisable to use some other type of cover.

(5) If cutworms or elephant beetles are suspected, treat the bed before or just after sowing with poisoned bran or poisoned vegetation as explained above.

(6) While the plants are very small, spray occasionally with nicotine sulphate to kill the many kinds of small ground insects which may destroy the plants in this stage of growth.

(7) After the first leaves have reached the size of sixpence, and while the plants are still in the seed-bed, dust or spray regularly with arsenate of lead to control the tobacco leaf miner.

(8) After transplanting, treat the plants, as described above, for the control of the tobacco budworm as soon as the first signs of injury become manifest.

Growers are warned that general dusting or spraying of the crop in the field after transplanting is not advised, owing to the danger of excess arsenic remaining on the harvested crop. The recommendation is merely to shake small quantities of dust into the terminal buds only, should the budworm appear.

If this programme is systematically carried out there is no reason why much of the loss now occurring should not be averted.

(*Concluded.*)

The Food Value of Nuts.

ADDRESSING the Australian Nut Association, which conferred in Sydney in April, Mr. J. C. K. Sibbald (Brisbane) said that an acre of walnut trees in good bearing produced every year food the equivalent of 2,500 lb. beef, or 3,000 lb. mutton, or 3,500 quarts milk. Nuts, he said, had a higher food value than meats or fruits, and were twice as nutritious as fresh vegetables.

Vegetable Growing.

Summarised Reports of Some Recent Experiments.

Fertilise the Early Bean Crop.

With the sowing season for very early beans in the Gosford district at hand again, intending growers are recommended to give some consideration to the matter of fertilising the crop.

Last season Mr. A. C. Orman, Agricultural Instructor, conducted a manurial trial on the property of Mr. J. T. Bohringer, of Tumbi Umbi, near Wyong, and although it would not be wise to base definite conclusions on a one-year's trial, the results unmistakably favoured a fertiliser mixture containing both phosphoric acid and nitrogen, and, incidentally, upset the theory that legumes do not require a nitrogenous fertiliser.

Bean Fertiliser Trial on Mr. J. T. Bohringer's Farm.
Left: Unmanured. *Right:* Manured with P11 mixture.

The soil on which the beans were grown was a virgin sandy loam, and the seed and fertiliser were sown in separate but adjoining drills to prevent the seed coming into direct contact with the fertiliser. Sowing was carried out on 7th June, Tweed Wonder seed being used at the rate of 1 bushel per acre, the seeds being hand-dropped in drills 2 feet 9 inches apart, with 4 inches between the individual seeds. The fertilisers were applied half at sowing time and half as a top-dressing when the plants were hilled.

YIELDS in Bean Fertiliser Trials.

Fertiliser.	Yield per acre.		Increase yield per acre over no manure.	
	bus.	lb.	bus.	lb.
P11 mixture (652 lb. per acre)	471	7½	200	16½
P15 mixture (746 lb. per acre)	466	17½	196	6½
P12 mixture (652 lb. per acre)	415	2½	144	11½
Superphosphate (560 lb. per acre)...	407	16	137	5
Two parts superphosphate, two parts blood and bone, and one part sulphate of ammonia (652 lb. per acre)...	383	12	113	1
M22 mixture (560 lb. per acre)	378	0	107	9
Basic superphosphate (700 lb. per acre)	359	9	88	18
No manure	270	11	...	

NOTE.—P11 mixture contains six parts superphosphate and one part sulphate of ammonia.
P15 mixture contains three parts superphosphate and one part sulphate of ammonia.
P12 mixture contains six parts superphosphate and one part sulphate of potash.
M22 mixture contains equal parts of superphosphate and bonedust.

Top-dress Cauliflowers with Sulphate of Ammonia.

It is of seasonal interest to cauliflower growers to be reminded that trials carried out by the Department over a number of years have demonstrated the value of an application of sulphate of ammonia as a top-dressing between the rows of cauliflowers just prior to the time when the plants are beginning to form up the "buttons." The application recommended is about 1 cwt. per acre.

Thorough Soil Preparation Essential for Tomatoes.

Under conditions ruling to-day, tomato-growing, particularly for the early crop, has become a business that requires special skill and care, haphazard methods being no longer payable. It is as well to remember that the correct preparation of the ground is just as important as any other phase of tomato culture. The first ploughing should be given as early as possible, certainly not later than June. Where practicable, organic matter, such as cow manure, should be incorporated with the soil during the early preparation. Growers on the North Coast, particularly those on the light stony, soils, have found cow manure excellent for tomato growing. Some growers wisely subject their tomato land to a rotation, which involves the sowing in March or April of a winter legume such as field peas, thereby increasing the nitrogen and humus content of the soil. The legume has usually made sufficient growth for ploughing under in June. The land should be cultivated as often as is necessary to destroy weeds and bring it into a fit condition to grow a heavy crop of tomatoes, as it is only by efficient soil tillage that the maximum benefits can be derived from any fertilisers applied. It should be remembered that fertilising is not a substitute for thorough tillage—the two practices are interdependent.

Rapid Red Best Beetroot for Bathurst District.

In trials carried out during the last three years on the fairly heavy granitic soils on the Bathurst Experiment Farm, Rapid Red, with an average yield of 8 tons 4 cwt. per acre over the three seasons, outyielded such varieties as Nonpareil and Krempin's Combination, with comparable

yields of 7 tons 12 cwt. and 5 tons 5 cwt. respectively. New Hescrow and Detroit Dark Red were tried last season for the first time, their yields being 4 tons 17 cwt. and 5 tons 12 cwt. respectively.

Rapid Red, apart from being the best yielder under trial, produces roots of good size and quality, and is undoubtedly the best market variety under trial, according to Mr. G. T. Dawson, Experimentalist, who conducted the trial. Its main fault is that it is liable to split and grow coarse rather quickly if it is left in the ground after it has matured. Detroit Dark Red is considered to be a promising variety, being deeper in colour and of finer texture than Rapid Red.

It Pays to Fertilise Beetroot.

Trials extending over the last two seasons on the granitic upland soils of the Bathurst Experiment Farm indicate definitely the profitableness of applying a phosphatic fertiliser (basic superphosphate for preference) to beetroot. Last season the yields from the various plots were as follow:—372 lb. per acre of P13 mixture (six parts superphosphate and one part each of sulphate of ammonia and sulphate of potash) yielded 9 tons 3 cwt. per acre; 280 lb. per acre of superphosphate alone yielded 8 tons 7 cwt.; 350 lb. basic superphosphate yielded 8 tons 5 cwt.; 326 lb. of P11 mixture (six parts superphosphate and one part sulphate of ammonia) yielded 7 tons 11 cwt.; a similar application of P12 mixture (six parts superphosphate and one part sulphate of potash) gave the same yield; 280 lb. of M22 mixture (equal parts of superphosphate and bonedust) yielded 6 tons 18 cwt.; while the unmanured plot yielded only 5 tons 13 cwt. per acre.

Taking the ruling rates for fertilisers and valuing the beetroot at £10 per ton, the net gains per acre due to the use of the different fertilisers work out as follows:—Basic superphosphate, £26 5s. 4d.; superphosphate, £24 12s. 6d.; P13 mixture, £21 11s.; P12 mixture, £17 6s. 10d.; P11 mixture, £15 4s. 8d.; and M22 mixture, £12 3s. 9d.

Potato Strain Trials on the Lower North Coast.

Even though Factor has proved the best variety of potato for most coastal conditions, there is found to be a great variation in yield between the best and the poorest strains of this variety. This fact influenced the Department to institute strain trials some years back. These have been continued each season and are valuable in indicating to farmers the most productive strain to grow and, incidentally, the best sources of seed supply.

Last season Mr. J. M. Pitt, Senior Agricultural Instructor, conducted two trials, one at Mt. George and the other with Mr. J. G. Ward, at Sherwood, Macleay River. The former trial failed owing to Irish blight, while the yields from the latter are as follows:—W. White's strain of Factor, 8 tons 16 cwt. per acre; H. E. Price's strain, 8 tons 14 cwt.; J. Flood's strain, 8 tons 3 cwt.; W. Walsh's strain, 7 tons 9 cwt. Price's strain was a little later in maturing than the others, and it also produced more top growth.

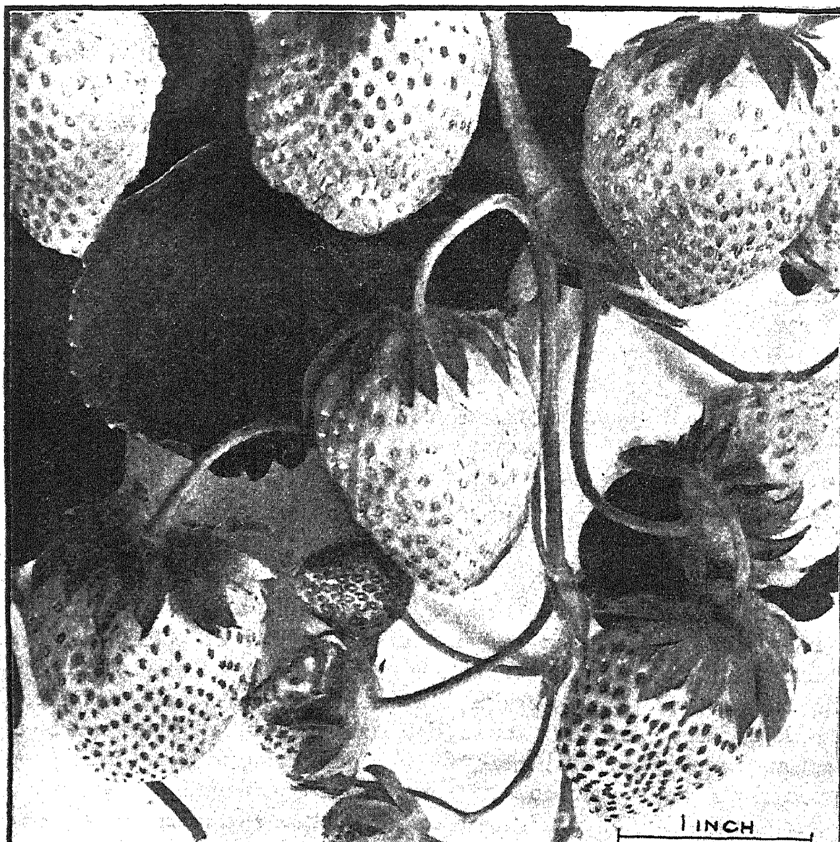
The plots were sown on 8th August, two days prior to which date the drills had been opened up and superphosphate distributed along them at the rate of 2 cwt. per acre.

Strawberry Culture.

R. B. THOMAS, Orchard Inspector.

Introduction.

THE strawberry finds universal favour both in the fresh state and conserved, and is regarded more or less as a luxury. Our present varieties have been evolved from the wild strawberries which are found growing in the woods and coppices in the United Kingdom, and from the mountain strawberry which grows in the ranges of Europe and North America.



Fendeleino—a Popular Variety in the Suburban Area.

Strawberry culture provides a congenial means of supplementing the family income on small suburban farmlets, etc. The work is light and interesting and can be performed by women and children without undue exertion. Only a small area of land is required, and the necessary implements comprise a spade, flat and fork hoe, rake and some means of irrigation.

After the plants have been raised the cost of establishing a quarter acre is comparatively small. A quarter of an acre of strawberry plants well cared for will produce, under normal conditions, 2,000 12-oz. punnets of fruit, or approximately 13 cwt. 2 qrs., which is at the rate of 2 tons 14 cwt. per acre. Considerably heavier yields have been obtained, and, like all other crops, at times there are total or partial failures. A 2,000-punnet crop at 7s. per dozen would represent a gross return of £58 6s. 8d.

At Fairfield, a piece of land 7 yards by 14 yards, which had been used for a fowl run for five years, was dug up and planted with Fendelcino, pollinated with Port Macquarie. There were approximately 1,000 plants set out 17 inches by 9 inches. They produced fruit to the value of £13, also 27 lb. for jam, £3 10s. for plants sold, and the grower reserved 7,000 plants for his own use.

Though the above gross returns appear inviting, it will be shown later that if all expenses of production are strictly accounted for, the net return is not by any means considerable—at any rate when the selling price of the fruit is taken at 7s. per dozen punnets and plants sold at 18s. per 1,000.

Suitable Location and Soil.

The choice of the site for the plantation is very important, a north-easterly aspect being very desirable. A good water supply is essential. Adequate means of access to a market without undue rough handling, expense or delay, is another factor of importance. It is also advisable to have the strawberry beds as near the house as possible, as birds at times get troublesome, and it will be found easier to keep them out of the beds when they are handy to the house.

Though strawberries can be grown satisfactorily in almost any kind of soil that will produce other crops, the most suitable is a sandy loam about 10 inches deep with a friable clay subsoil.

The fruit is generally of bright appearance when grown in sandy soils, and the roots develop satisfactorily, thus enabling the plants to assimilate more readily the nutriment applied to the land. Moreover, sandy soils are easier to work and do not set hard.

Where possible, vergin land should be used, as there is less likelihood of loss from diseases and pests. Weeds also are less troublesome on new ground, which, as in the case of other crops, results in better yields.

Preparation of the Land.

The strawberry is a very shallow rooting plant and rarely develops its roots below 16 inches. The preparation of the land prior to sowing is of great importance and will more than compensate the grower for any extra work involved. All persistent weeds, such as couch or paspalum, should be eradicated, or they will give endless trouble after the beds are established. The land should be ploughed or dug to a depth of 8 to 10 inches and given a dressing of blood and bone at the rate of 11 cwt. per acre or a heavy application of fowlyard or stable manure. Bush rakings or other

bulky organic matter that will rot readily are beneficial, it being generally recognised that little benefit can be derived from commercial fertilisers if there is an absence of rotted organic matter in the soil. The foregoing operations should be completed at least six or eight weeks before planting. Prior to planting, however, the land should be given another ploughing and working, and then kept in good condition until actually planted. Any surface drains that are required to prevent erosions of the soil should be put in before the plants are set out in the beds.

Propagation of Strawberry Plants.

During the fruiting season the established plants send out runners, and wherever the nodes of the various buds come in contact with the ground, roots are formed, an independent plant ultimately developing at each node

When the plants are being grown for fruit the runners must be removed from the plants whilst fruiting. After fruiting they are allowed to develop, and one can usually rely on each plant developing from ten to fifteen well-rooted plants, provided the parent plants are kept in good condition. I have grown one plant with a view of propagating as many plants as possible. All flowers were removed and the plant kept well watered and the soil loosened to encourage rooting. This one plant produced 123 well-rooted plants in the one season, and occupied 9 square feet of land.

It can thus be seen that if a person wished to plant, say, one quarter of an acre of strawberries, the plants could be produced comparatively easily, provided they were not required until the following season.

Methods of Planting.

Two methods of planting are practised, viz., the level single row method and the slightly raised bed. The former is preferred by most growers, and personally I consider it the better method.

When planting in single rows the rows should be 20 inches apart and the plants set from 7 to 8 inches apart in the rows. Approximately 10,000 plants are required to plant a quarter of an acre at this spacing. Strawberry plants can be purchased from 18s. to £1 per 1,000, and should be procured from a reliable source. These distances are suitable for the chief varieties (Fendelcino and Creswell's Seedling) grown in the metropolitan area. Fendelcino and other strong-growing varieties should be given the wider spacing stated above. By the end of the first fruiting season the plants will have grown together in the rows and appear as a continuous matted row, no space remaining between the plants in the rows.

The most satisfactory way to develop a matted bed is to peg the area to be planted out into beds 3 feet wide, allowing 14 inches between the beds for a path for picking, etc. The soil to a depth of from 4 to 6 inches in these 14-inch paths is then dug out with a spade and spread evenly over the beds where the plants are to be planted, thus forming a surface drain, path, and a raised bed for the plants. The plants are then planted in rows 16 inches apart, commencing 10 inches from the outside of the beds. Planted by this

method it would take 6,272 plants to plant a quarter of an acre. When these plants are fruiting the first season all runners should be kept removed. After the crop is harvested the bed requires to be loosened up with a fork and kept well watered to produce plants which will be used for developing the matted bed.

How Many Plants Per Acre?

The numbers of plants required, at various spacings, to plant 1 acre are shown in the following table:—

TABLE showing Numbers of Plants per Acre.

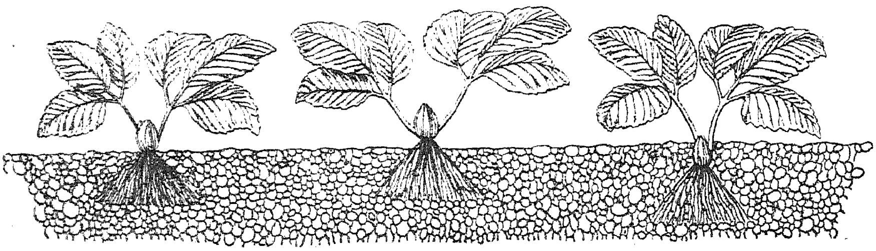
Distance between the rows.	Distance apart in the rows.	No. of plants required per acre.
	Single-row System of Planting.	
20 inches ...	6 inches	52,272
20 ,, ...	7 ,, ...	44,805
20 ,, ...	8 ,, ...	39,204
20 ,, ...	9 ,, ...	34,848
20 ,, ...	10 ,, ...	31,363
24 ,, ...	6 ,, ...	43,560
24 ,, ...	7 ,, ...	37,337
24 ,, ...	8 ,, ...	32,670
24 ,, ...	9 ,, ...	29,040
24 ,, ...	10 ,, ...	26,136
	Triple-row System.	
10 inches ...	Triple-rows 20 inches apart. Plants 6 inches apart in rows	78,408
10 ,, ...	,, 20 ,, ,, 7 ,, ,, ...	67,206
10 ,, ...	,, 20 ,, ,, 8 ,, ,, ...	58,806
10 ,, ...	,, 20 ,, ,, 9 ,, ,, ...	52,272
10 ,, ...	,, 20 ,, ,, 10 ,, ,, ...	47,045
10 ,, ...	,, 24 ,, ,, 6 ,, ,, ...	71,280
10 ,, ...	,, 24 ,, ,, 7 ,, ,, ...	61,097
10 ,, ...	,, 24 ,, ,, 8 ,, ,, ...	53,460
10 ,, ...	,, 24 ,, ,, 9 ,, ,, ...	47,520
10 ,, ...	,, 24 ,, ,, 10 ,, ,, ...	42,768

Planting.

The most popular time for planting is from April to May. Planted at this time the plants have a chance to become well established in time to produce the main crop. However, planting can be carried out up till the end of August. If the winter is wet, late plantings often give the best results, provided the plants are grown for more than one year.

Plants are generally received in bundles of fifty. They should have good roots and must not be allowed to dry out. It is advisable to open a trench (near a water supply) and lay the plants in it so that the crowns are above the surface of the soil: the roots may then be covered with soil and the plants kept moist by watering until required.

Before planting, the outside leaves should be removed, leaving only two or three of the centre leaves and the crown. If the roots are too long they should be shortened to about 3 inches.



1 2 3

No. 1 is correctly planted, No. 2 is too high, and No. 3 too low.

A line should be used for planting. The plants should be carried in a bucket of water or wet bag, and set out in holes made with the hand or trowel. The plants must be set firmly with roots spread out and at the same depth at which they grew in the nursery (see illustration). If set too high, or if the soil is not firmed sufficiently around them, the young plants will dry out and die. If set too low, and the crown of the plants is covered with soil, the plant is liable to rot.

Plants should receive a watering as soon as possible after planting, chiefly to firm the soil around the plants and prevent drying out.

(*To be continued.*)

Australian Nut the Best in the World.

Professor J. A. Neilson, of Michigan Agricultural Experiment Station, U.S.A., after sampling the Australian nut (*Macadamia ternifolia*), declares that it has "the best flavour in the world." Australians who have tasted the nut—strange to relate there are very many otherwise good Australians who have not—will agree with the Professor. In fact, the popularity of the Australian nut is now world wide, and the possibilities of the industry appear very encouraging. To further the Australian nut industry is the object of the Australian Nut Association, which held a conference at Sydney recently to discuss different aspects of the industry.

A Cement Paint for Iron Roofs.

Continual expansion and contraction as the result of extremes of heat and cold, and the absence of a good grip or key make ordinary house paint unsuitable for use on galvanised iron roofs. A paint specially manufactured for the purpose is therefore advisable. However, a cheap roof paint can be made by mixing 14 lb. cement with 1 gallon of boiled linseed oil. This should be kept thoroughly stirred during use and is best applied during warm weather.

Prevent Mould Decay in Oranges.

Departmental Experiments Show How This Can Be Done.

R. J. BENTON, Special Fruit Instructor.

Even in an average season green mould (*Penicillium digitatum*) takes heavy toll of the orange crop between time of harvesting and marketing. Experiments carried out over several seasons by the writer have demonstrated, however, that most of the loss can be prevented by immersing the fruit in a borax or bicarbonate of soda solution. Last season certain proprietary substances were tested, and one of these also gave very promising results.

The effectiveness of the borax and bicarbonate of soda treatments of oranges for the prevention of green mould decay was demonstrated by experiments carried out over the five years, 1926 to 1930, at Gosford, and the three years, 1928 to 1930, at Griffith. The results are summarised in the table hereunder:—

Percentage of Green Mould Decay.

Year.	Gosford Experiments.			Griffith Experiments.		
	Untreated.	Borax.	Sodium bicarbonate.	Untreated.	Borax.	Sodium bicarbonate.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
1926	15·4	1·2	....	....	....	....
1927	7·0	1·3	....	....	....	....
1928	5·1	·1	·2	3·8	·4	1·3
1929	13·2	....	4·8	3·6	....	·5
1930	33·5	1·4	7·1	12·9	2·3	7·7

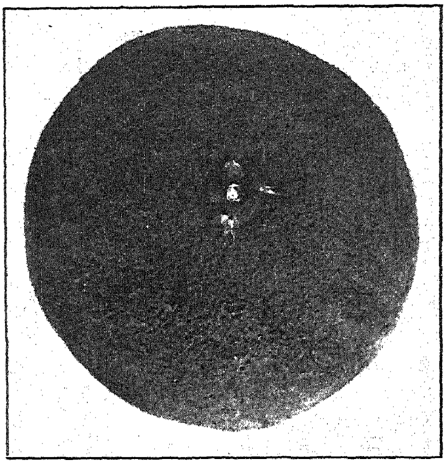
The borax treatment, which showed up so well, consists of immersion of the fruit for four minutes in a solution of 8 lb. borax to 100 lb. water, heated to 110 deg. Fahr.

Variation from year to year in the percentage of decay in the untreated lots is due to seasonal conditions.

Sodium chloride (common salt) and alum were other substances tried, but these proved of little value.

Proprietary Substances Tested.

Favourable reports from California concerning a proprietary substance used in several citrus packing houses in that country led the Department to investigate four proprietary mould preventives last season. For the purpose of this report these will be designated "CH," "WS," "W3," and "AY."



An Orange showing the type of injury brought into contact with Green Mould.

"CH" is a sodium hypochlorite solution and was used in cold water at 1 per cent. strength. It is considered an excellent steriliser for prevention of mould in dairy practice.

"WS" is a proprietary steriliser used in hot or cold water in cleansing dairy utensils, etc.

"W3" is the proprietary material that is used in Californian packing houses.

"AY" is a proprietary product (sodium meta silicate) used in dairy cleansing practice.

To ensure uniform mould infection of all oranges subjected to the different treatments they were mechanically infected, by first puncturing the skin with a nail and then rubbing a green-mouldy orange on the injury. The oranges were then wrapped and stored for not less than two weeks at normal temperatures to encourage development of mould.

The result of the various treatments are shown in the following table. The treatment in each case consisted of immersion for four minutes (unless otherwise stated) at 100 to 110 deg. Fahr.

RESULTS of the Various Mould Prevention Treatments.

Date.	Treatment.	Original Number.	Number Sound.	Inspection Date.	Remarks.
9-8-32	Control (untreated) ...	10	0	26-8-32	
	W3	10	2		
	4 per cent. Borax	10	4		
26-8-32	Control (untreated) ...	12	0	9-9-32	
	WS	12	0		
	W3	12	7		
	5 per cent. Borax	12	5		
	CH	12	0		
9-9-32	Control (untreated) ...	10	0	23-9-32	
	Control Paraffined... ...	10	0		
	W3	10	0		
	W3 Paraffined	10	0		
	5 per cent. Borax	10	10		
	5 per cent. Borax Paraffined	10	10		
	CH	10	0		
	CH Paraffined	10	0		

RESULTS of the Various Mould Prevention Treatments—*continued.*

Date.	Treatment.	Original Number.	Number Sound.	Inspection Date.	Remarks.
23-9-32	Control (untreated) ...	10	4	6-10-32	
	W3	10	6		
	3 per cent. Bicarbonate of soda.	10	10		
	5 per cent. Borax	10	10		
	1 per cent. Borax	10	6		
21-10-32	Control (untreated) ...	10	0	8-11-32	
	W3	10	6		
	2 per cent. W3	10	4		
	3 per cent. Bicarbonate of soda.	10	3		
	5 per cent. Borax	10	9		Immersed 4 minutes.
	5 per cent. Borax	10	9		Immersed 3 minutes.
11-11-32	Control (untreated) ...	10	0	29-11-32	
	5 per cent. Borax	10	5		Rinsed.
	2½ per cent. Borax ...	10	4		Rinsed.
	5 per cent. Bicarbonate of soda.	10	2		Rinsed.
	5 per cent. Bicarbonate of soda.	10	3		Not rinsed.
	5 per cent. Borax	10	7		Not rinsed.
	2½ per cent. Borax ...	10	5		Not rinsed.
	2½ per cent. Bicarbonate of soda.	10	2		Not rinsed.
	2½ per cent. W3	10	6		Not rinsed.
	1¼ per cent. W3	10	2		Not rinsed.
	5 per cent. Borax	10	8		Not rinsed Dipped for 2 minutes.
29-11-32	Control (untreated) ...	10	0	13-12-32	
	5 per cent. Borax	10	8		Rinsed } Dipped at 96 to 104 degrees.
	2½ per cent. Borax ...	10	6		Rinsed
	2½ per cent. Bicarbonate of soda.	10	3		Rinsed } Dipped for 4 minutes.
	5 per cent. Borax	10	9		Not rinsed
	2½ per cent. Borax ...	10	10		Not rinsed
	5 per cent. Borax	10	10		Not rinsed } Dipped for 2 minutes.
	2½ per cent. Borax ...	10	7		Not rinsed
	2½ per cent. Bicarbonate of soda.	10	5		Not rinsed Dipped for 2 minutes at 104 degrees.
	2½ per cent. Bicarbonate of soda.	10	6		Not rinsed Dipped for 4 minutes.
	2½ per cent. W3	10	7		Not rinsed } Dipped for 4 minutes at 106 degrees.
	2½ per cent. AY	10	9		Not rinsed

Subsequent Rinsing with Water Inadvisable.

Although one season's test is insufficient on which to base definite conclusions, rinsing oranges with fresh water after the borax or bicarbonate of soda treatment appears to render them less resistant to mould decay. As rinsing with some substance is necessary to remove the whitish residue, particularly after immersion in borax, tests with rinsing solutions other than water are advisable.

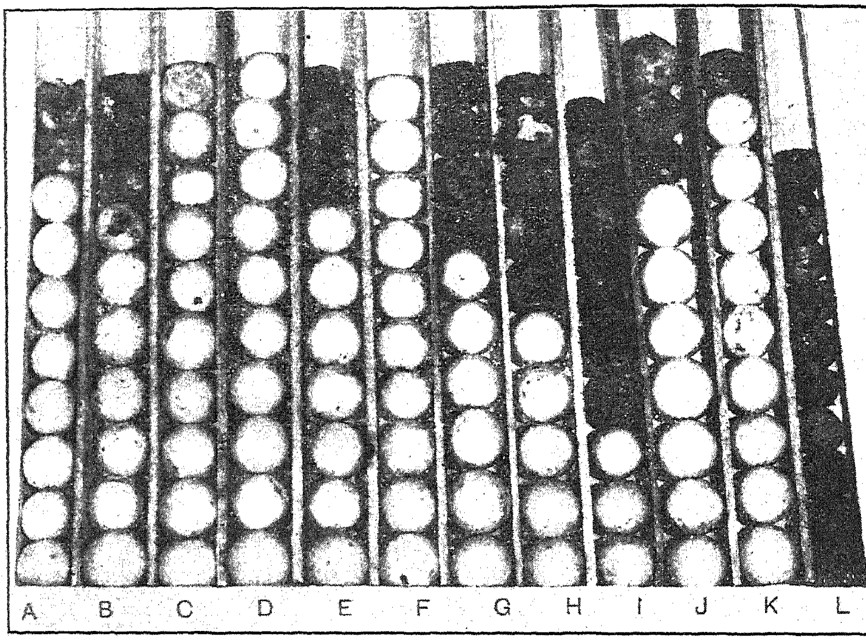
The results of the rinsing test last season are shown hereunder:—

TABLE Showing Percentage of Sound Fruit after Treatment.

Treatment.	Rinsed.	Not Rinsed.
	per cent.	per cent.
5 per cent. borax solution	65	80
2½ ,, ,, ,, ...	50	75
2½ ,, bicarbonate of soda solution	30	60

Can the Immersion Period be Reduced?

It would not be wise to draw conclusions from last season's trial alone, but it seems to point to satisfactory results being obtained with a shorter immersion than the recognised four minutes.



Fruit at the Conclusion of one Trial.

The results of treatments on injured and mould infected fruit treated on 29th November, 1932, and inspected on 14th December, 1932.

A.—5 per cent. borax
B.—2½ per cent. borax } Rinsed after 4 minutes treatment.

C.—5 per cent. borax
D.—2½ per cent. borax } Not rinsed after 4 minutes treatment.

E.—2½ per cent. borax
F.—5 per cent. borax } Not rinsed after 2 minutes treatment.

G.—2½ per cent. bicarbonate of soda. Not rinsed after 4 minutes treatment.
H.—2½ per cent. bicarbonate of s oda. Not rinsed after 2 minutes treatment.
I.—2½ per cent. bicarbonate of soda. Rinsed after 4 minutes treatment.
J.—2½ per cent. W3. Not rinsed after 4 minutes treatment.
K.—2½ per cent. AY. Not rinsed after 4 minutes treatment.
L.—Controls (untreated).

In last season's tests (in which none of the fruit was rinsed after treatment) immersion in a 5 per cent. borax solution for four minutes resulted in 80 per cent. sound fruit as compared with 90 per cent. where the immersion was for only two minutes. When immersed in a 2½ per cent. borax solution for four minutes the percentage of sound fruit was 75 as against 70 per cent. when the period of immersion was two minutes.

Banana Packing Sheds.

Hints as to their Layout and Construction.

H. W. EASTWOOD, Senior Fruit Instructor.

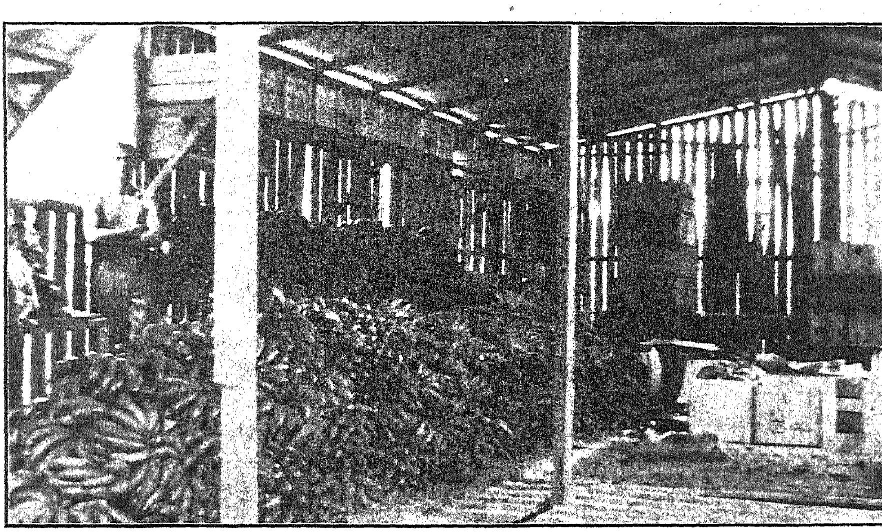
Distinct advancement has been made in the cultivation and production of bananas during recent years, but the same satisfactory progress is not evident in the improvement of buildings or structures used for packing sheds.

Although many growers do not realise it, the manner in which bananas are handled and packed is just as important as the growing of the fruit, and to carry out the former operations efficiently and economically requires a suitable packing shed.

It may also surprise many growers to learn that a dirty shed and surroundings may be responsible for disease and wastage in cased fruit after it leaves the packing shed for market.

Many Present-day Sheds are Crude Structures.

WHILE good packing sheds are to be found in some plantations, a few growers are satisfied to pack their fruit in the open in the shade of the stools. Others erect only a temporary overhead covering for shade, and



A Spacious and Well-constructed Packing Shed.
Mr. C. Vlismas' Packing Shed at Carool.

many that do put up sheds are content with crude and congested structures in which the crop is only handled with difficulty.

Generally, the sheds are too small for the amount of fruit that is handled regularly, and more so when the "cut" happens to be a heavy one. The inconvenience thus caused by overcrowding the floor space with bunches

lessens speed in handling, packing, etc., and forcibly demonstrates that anything short of a suitable packing shed is false economy. Furthermore, earth floors are frequently seen in the sheds. These become muddy in wet weather or dusty in fine weather.

Hints on the Construction of Sheds.

The shed space required depends on the size of the plantation, but in lieu of one big structure for large areas, smaller sheds located at advantage points in the plantation are more desirable. Each shed should be large enough to accommodate comfortably the maximum quantity of fruit to be handled at any one cutting from the section of the plantation it is intended to serve. By having more than one shed the fruit is conveyed quicker to the sheds, the number of handlings is reduced to a minimum and consequently the bunches are less likely to be damaged or bruised. This latter is an important factor in handling the crop, as it directly influences returns.

In constructing a packing shed the aim should be to secure the greatest possible economy in labour and time in the working of the shed. It should be built so that the fruit can be handled and packed in a systematic manner, and this can hardly be accomplished unless the shed is sufficiently spacious and planned for convenience. The best arrangement is that which provides for the fruit passing through the different operations in an orderly way, moving in one direction from the receiving point to the exit or loading stage. Although there is not a great deal of equipment in a banana-packing shed, by conveniently arranging what there is, improvements can be made to ensure economy in carrying out the work.

Benches can be made any length to suit the shed, but they should not be so wide as to cause the packer to overreach. Slats or battens placed closely are preferable to solid board benches, as the former allow any rubbish to fall through, besides allowing some of the sap to drain away from the fruit. Benches can also be made of canvas or sacking, but they are better if removable for cleansing purposes. The different grades of fruit should be defined by a distinct mark on the benches.

There should be sufficient covered-in floor space to accommodate all bunches one tier deep only and for fruit as "handed off" and placed in grades unless benches are used for this purpose. As the bunches are de-handed, floor space becomes vacant for "handed off" fruit or other purposes. Floor space is also required for packing, nailing on the lids, and stacking packed cases. Shook timber should be kept under cover from the weather, but may be put in racks or shelves to save floor space, and likewise cases made up prior to packing can be placed overhead on shelves.

Suitable Materials to Use.

Where it is necessary or convenient to erect sheds at the bottom of plantations or in low situations, it is wise to ensure that the building has good drainage. The floor of the shed should be kept dry by either building

it up high enough off the ground on blocks, or else making good surface drains around the shed to carry away or divert surplus water, especially storm rains.

While it is not the writer's intention to advocate the erection of elaborate or expensive packing sheds, it is desirable that they should contain ample space, be convenient for working, of fairly solid construction, weatherproof and well lighted and ventilated.

The framework can be erected with bush timber and the floor and walls with slabs or split timber if such is conveniently available, otherwise second-class sawn timber is mostly used. The floor needs to be solid, with a reasonably smooth surface, as most of the work is performed on it. Galvanised iron is suitable for roofing, but hardly suitable for other parts of the shed, because it makes the building too hot. A high roof tends to keep the shed cool.

A closed-in shed is the best with large windows and doors to provide for plenty of light and ventilation when in use. As the sun should always be kept off the fruit after it enters the shed, open doorways, windows or sides should be provided with temporary coverings. Open sheds should at least be boarded on the weather sides. Sacking of good quality or dressed bags are sometimes ultilised for the walls of the sheds, and these materials are fastened so that they can be rolled up when required. Such materials are suitable just as long as they will remain weatherproof.

If wireways lead to the shed these might be taken through the shed and fastened to the far wall in preference to the front, so that the bunches are carried right into the shed. This will mean that the shed where the wires enter will need to be a foot or so higher than where the wires are fastened.

Filthy Sheds a Source of Trouble.

While there may at times be reasons for the erection of inadequate and unsuitable packing sheds, there can be no reasonable excuse for the unsatisfactory manner and dirty condition in which a number of sheds are kept. Very little attention is given to some sheds and their immediate surroundings; the floors are dirty and discarded fruit is left lying about and becomes trodden into the earth floors. Stalks of bunches, together with rejected fruit, diseased or otherwise, are generally thrown just clear of the shed through doorways or windows and allowed to rot and decay there, producing a muck heap and giving off objectionable odours. Growers handling fruit in these surroundings would be surprised, perhaps, to learn that such conditions may be responsible for diseases and wastage in the cased fruit after it leaves the packing shed. Thus the wisdom of keeping the shed and its surroundings clean. The benches and floors should be swept out regularly after packing is completed and all the debris, including rejected fruit and stalks, removed far away from the sheds. It could, perhaps, be buried in the plantation.

The sheds might also be sprayed periodically with a disinfectant such as formalin. Where the floor is covered with bags or sacking for receiving the

fruit, these should be discarded when they get into a dirty condition, or else cleansed by dipping in boiling water or a disinfectant before further use. Some inexpensive material such as dried grass, which could be destroyed after packing is finished, would be preferable for cushioning the floor. Avoid using banana leaves, for, although they serve the purpose, it is most likely that in other ways they are definitely detrimental.

"Handed-off" fruit which is kept for any length of time before packing in open or semi-open sheds would be all the better if covered with a clean, light tarpaulin or sheet.

Spray materials, and particuarly poisons, should be kept away from all fruit and other materials in a secluded part of the shed.

In a properly managed shed there should be a place for everything, and everything should be kept in its place.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1932 budding season, trees from which should be available for planting during the 1933 planting season :—

Nurseryman.	Oranges.		Eureka. Lemon.	Marsh. Grape-fruit.	Total.
	Washington Navel.	Valencia.			
L. P. Rosen and Son, Carlingford...	4,000	4,000	1,000	1,000	10,000
T. Adamson, Ermington	1,500	1,500	500	250	3,750
A. T. Eyles, Rydalmere	2,000	1,000	...	...	3,000
H. J. Ferguson, Wyong	...	200	...	...	200

—C. G. Savage, Director of Fruit Culture.

Orchard Notes.

June.

C. G. SAVAGE and R. J. BENTON.

Marketing the Citrus Crop.

Most citrus varieties have either just reached maturity or will do so within the next few months. Consequently harvesting and marketing will be demanding attention. With the exception of Emperor mandarins, the crop of which is heavier than last season's, citrus yields are below the heavy production of last year. Despite the lighter yields, greater marketing difficulties than ever appear to confront growers, necessitating careful planning. In the absence of co-operative organisation, the course to be adopted must be worked out by the individual grower. A "wait and see" policy in marketing promises to be particularly unwise in the immediate future. The absence of a market in New Zealand is a very serious loss, whereby practically the whole of our citrus crop will be thrust on to the local (Australian) markets, only a small proportion (about 3 per cent.) being absorbed by the United Kingdom, the Far East and the Canadian market.

Growers are urged to avoid holding back consignments. High returns cannot be anticipated, and holding off marketing to take advantage of temporary price increases is likely to result in price levels declining more rapidly. It is therefore recommended that smaller consignments be dispatched regularly and over as long a period as possible. Advantage will accrue, too, as a result of marketing only the best selling sizes in the better grades. Small sized fruit for the variety in all grades and any sized fruit in, say, plain grade is generally only going to depress values.

In order that local markets may be relieved of supplies as far as possible, every opportunity to export fruit should be grasped. With monetary fluctuations in overseas countries of frequent occurrence, highly profitable returns are not likely, but if the demands of the market are properly studied and conformed to, the prospects are sufficiently good to warrant participation in such trade.

Citrus for Export.

Oranges will be exported to a number of overseas markets. The main outlet for lemons is Canada; smaller amounts are taken by the East, which market may also be an outlet for mandarins.

Whilst the quality of the fruit exported is a most important factor, it may be necessary at times to use discretion as to the market to which certain grades or qualities are despatched. In all markets the size of fruit in demand should be considered. The most desirable sizes range in count from 216 to 252 per case, representing fruit ranging from $2\frac{3}{4}$ down to $2\frac{1}{4}$ inches. A small proportion of slightly larger, also smaller, fruit may be

included in the consignment, but counts outside 176 to 288 are not desirable. Packing in special export cases which contain about 1½ bushels is necessary. A leaflet on the preparation of citrus fruit for export is available on application to the Department.

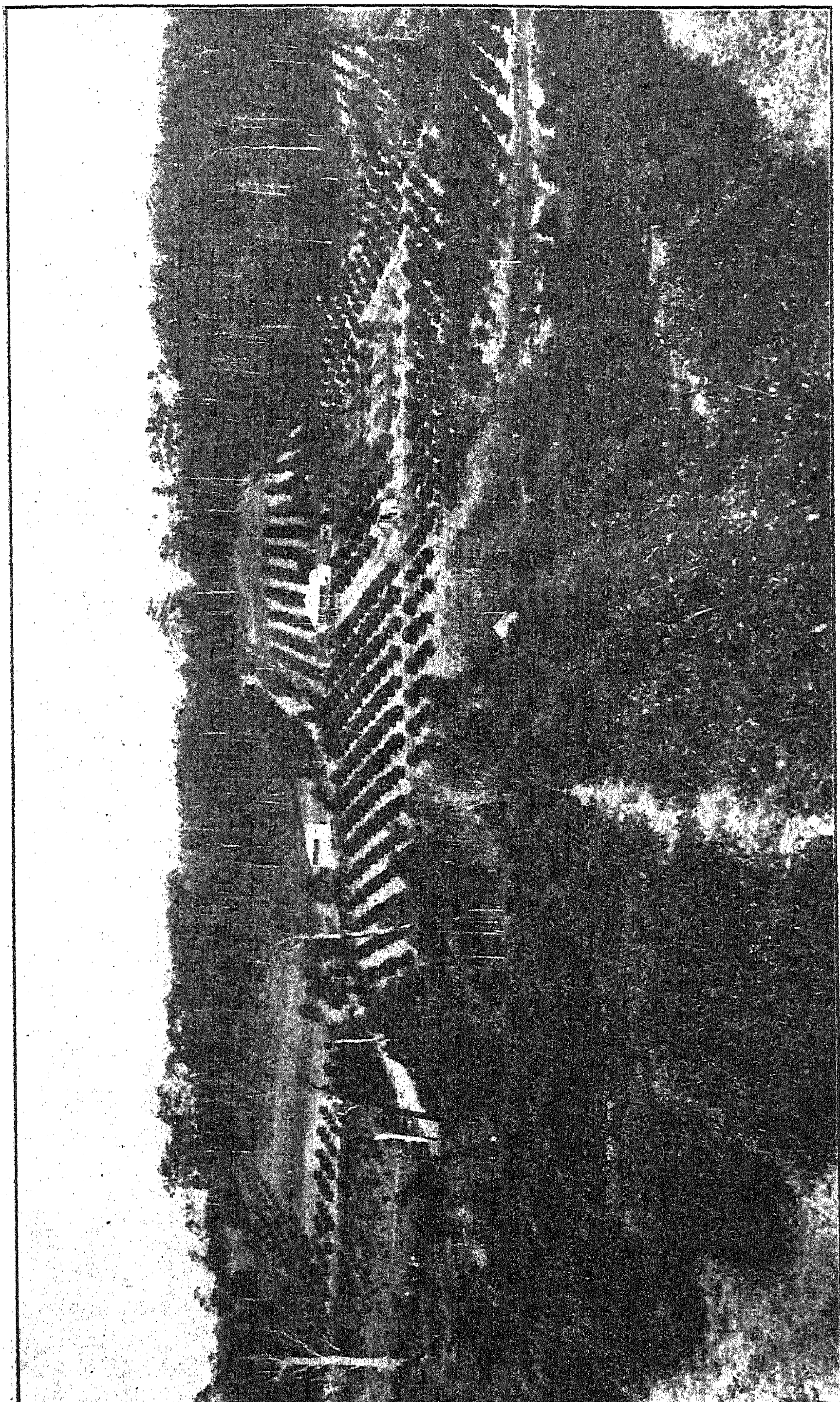
The Canadian and Eastern markets are accustomed to mature (sweet) fruit, and in the former case, at least, to very well-packed, full cases. The markets in the United Kingdom, on the other hand, are annually supplied by Mediterranean growers with fruit which early in the season is scarcely mature, and is not so highly standardised in its presentation to the trade. Competition with Brazil, South Africa, and California, however, must be met, in which an increasing standard of efficiency is evident.

Lemons for export should be partially cured to minimise shrinkage and decay. The popular trade sizes range between 300 to 360 per case (1½ bushels), representing fruit from 2⅜ to 2¼ inches in diameter. The fruit needs several weeks' storage to ensure that it is partially cured—at least three or four weeks during the winter months. It should be selected only from trees in good condition and grown on soils favourable to its regular development, and it should be carefully clipped.

The increased areas which have been planted to lemons in recent years and the growing importance of the export trade make it necessary that greater attention be given to curing. In this connection the remarks of Mr. A. T. Hunter, Senior Fruit Instructor, based on observations made during the last year or two, are of interest. On soil and in some degree on weather conditions, he states, depends mainly the development of lemons. Where the development is uninterrupted and gradual, medium to large-sized fruit is obtained, which (other things being equal) is of high vitality and therefore keeps well in storage. Weak fruit develops more erratically, and may at times mature when of not more than small or medium size. One indication of weakness is irregularity of colouring, such as a tendency to yellow rapidly in parts instead of silvering uniformly. Such fruit should not be stored long or exported.

The amount of shrinkage which may occur in a storage period of six or seven months without the fruit losing in condition may range over 35 per cent. Small-sized fruit at picking (say, of 2¼ inches diameter) may be reduced by 40 per cent. and still be in firm marketable condition.

Where it is proposed to store over four months and it is not possible to control humidity, the lemons should be harvested when they are green or not more than silvery in colour, and they should not be clipped too small, as 2¾ inch diameter fruit may shrink to 2⅜ inches. The storage life is greatest when the fruit is green when clipped, but it should not be too immature or shrinkage will be accentuated. The regular harvesting (at about monthly periods) of fruit of the colour first mentioned when of a size over 2½ inches in diameter should permit of long storage and result in good returns, assuming that the point as to gradual and uniform change of colour is also observed.



Citrus Orchards in the Gosford District.

San José Scale and Peach Leaf Curl.

Treat Young Trees Before Planting.

It is a common occurrence to see young deciduous trees infested with San José scale and peach leaf curl a few months after they have been planted out in the orchard. In a reminder to readers on this subject, Mr. R. B. Thomas, Orchard Inspector at Westmead, recommends that, on receipt of the young peach and nectarine trees from the nursery, they be treated with Bordeaux mixture (6-4-40) and an oil spray, combined at the rate of one part of oil to twenty parts of the total mixture. Some growers may prefer

Leaf Curl of the Peach.

to use lime-sulphur, which is just as efficacious. This latter spray should be at full winter strength. Apple, pear and similar trees should be treated with miscible oil only.

As to the method of treatment, the young trees could be sprayed while in the trenches prior to planting out, or, after pruning preparatory to planting, they could be immersed in a cask of the spray, being plunged up and down a few times to ensure a uniform coating of spray over the whole of the plant, particularly the waxy-like surface of the young bark.

The roots of young trees should not be dipped in any spray or spray mixture that contains oil.

Treating Established Trees for Peach Leaf Curl.

Extensive field trials conducted by the Department have shown that peach leaf curl is easily and effectively controlled by spraying, either with Bordeaux mixture or lime-sulphur at winter strength, provided the spraying is carried out while the trees are still dormant but just before the buds swell. Care should be taken to cover every above-ground part of the trees, especially the extremities of small limbs and twigs, with spray.

Experiments have shown that in some districts 6-4-40 Bordeaux mixture, which is weaker than winter strength, will control the disease. In isolated cases growers have found it necessary to spray twice for peach leaf curl control, one application being given just before the buds swell and the second when the flower buds are showing colour. Such cases, however, are rare.

A leaflet on peach leaf curl is available gratis from the Department of Agriculture.

Treating Established Trees for San José Scale.

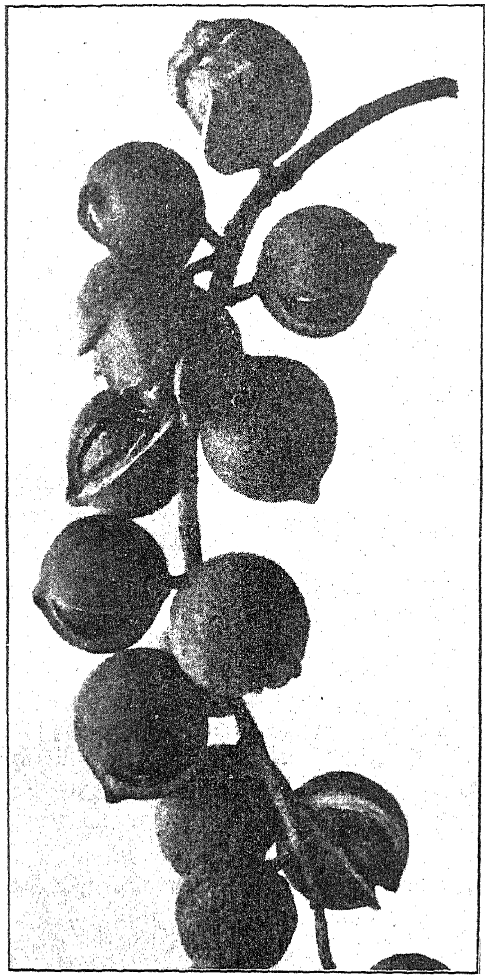
The trees should be sprayed during June or July with miscible red oil, one part to twenty-five gallons of water. This spray should be very thoroughly applied so as to cover all above-ground parts of the trees. Lime-sulphur at winter strength, applied as late as possible before the buds burst, may be used instead of miscible oil, especially where it is considered necessary to spray for the control of fungous diseases. The infested trees should be pruned before spraying and the prunings carefully burnt at once.

Winter control measures, properly applied, will result in clean fruit, which may be exported safely next season. Particular attention is drawn to this aspect, as stringent regulations exist against the export of fruit infested with this scale.

The Australian Nut.

A CORRESPONDENT recently inquired if the Australian Nut (*Macadamia ternifolia*) would grow successfully in the vicinity of Sydney.

In reply it was pointed out that the nut was a native of the big scrub country in Queensland and the North Coast of New South Wales. Consequently it did best in the semi-tropics, where it favoured the rich volcanic soil and sheltered positions. Although conditions in and around the metropolitan area could not be said to check up with the natural surroundings, yet judging from odd trees that were growing near Sydney the nut did



The Australian Nut.

fairly well, particularly on the deeper and richer soils and where well sheltered from winds. However, even under the most favourable conditions it was not to be expected that the trees would grow as luxuriantly as in the semi-tropics. The inquirer was also advised that it would take from seven to ten years for the Australian nut to commence to bear.

Quite a number of people are planting this tree for ornamental purposes.

Items, Topical and Otherwise.

Preparation of Land for Tree Planting.

THOSE who intend planting deciduous fruit trees during the present season are reminded that if the land has not yet been given a thorough preparation this work should not now be delayed. The earlier now that such trees are planted the greater is the likelihood of their satisfactory development. Virgin land will require at least two ploughings with some interval between to ensure a condition satisfactory for the trees' establishment.

Preparation of land for citrus planting at the end of winter should also be in hand.

Green Manure Crops.

Where green manure crops have been planted or weed growth is to be used for a similar purpose close watch should be kept of the soil's moisture content. If heavy frosty weather occurs and the soil is at all dry such crops should be immediately ploughed under to minimise frost injury to the trees.

The Citrus Gall Wasp.

(*Eurytoma fellis* Gir.)

N. S. NOBLE, M.Sc., B.Sc.Agr., D.I.C., Assistant Entomologist.

Introduction.

THE first record in literature concerning this insect was a note by Froggatt, published in the *Agricultural Gazette of New South Wales,* vol. 23, 1912, page 899. In this brief reference he states that galls on lemons submitted from the north coast of New South Wales had been caused by tiny wasps which laid their eggs in the woody tissue of the plant. No description or name of the insect was given.

Samples of citrus galls were received by the writer from Mr. G. B. Barnett, Fruit Inspector, from the Grafton Experiment Farm on 27th October and 19th November, 1931, with the statement that the galls were becoming very abundant in commercial orchards in the Grafton district.

The galls were placed in moist sand in jars, and later three species of wasps emerged. In the spring of 1932 a much larger series of galls was forwarded by Mr. Barnett, and from these a total of 4,143 wasps emerged, five distinct species being present.

Specimens of all the species were forwarded to Mr. A. A. Girault, of the Queensland Department of Agriculture, for identification. Of the total of 4,143 wasps, 1,924 were *Eurytoma fellis* Gir., 1,935 were *Epimegastigmus brevivalvus* Gir., 275 were *Epimegastigmus trisulcus* Gir., while eight were considered by Girault to be a new species which he named *Epibootania nonvittata,* while one specimen was *Megalyra* sp.

It then became necessary to prove which of these species was responsible for the gall formation, and having established this, to work out the interrelations of the various other wasp species occurring within the galls. Accordingly the various species were enclosed with small common lemon trees growing in 6-inch pots, within glass chimneys, and *E. fellis* females were found to oviposit freely in the young twigs, the various other species displaying no interest. The infested trees were grown in screen cages (20 inches x 9 inches x 9 inches) under quarantine conditions, and later developed the typical galls, proving that *Eurytoma fellis* was the species responsible for gall formation.

The study of all the species concerned has been continued by the writer for two seasons, and the life-history of *Eurytoma fellis* is now known. Moreover, it has been shown that *Epimegastigmus brevivalvus* Gir., and *Epimegastigmus trisulcus* Gir., are parasites of *Eurytoma fellis.* The biology of *Epimegastigmus brevivalvus* has been worked out by the writer, but it is proposed in the present paper to deal only with the life-history and control of *Eurytoma fellis,* the species responsible for the injury.

E. fellis is a typical small black wasp belonging to the Super-family Chalcidoidea Family Eurytomidae. The female measures approximately one-tenth of an inch in length, the male being very similar but less robust.

It was first described by Girault in 1928 from twig galls on wild lemon, collected at Nerang, Queensland.

Galls Caused by the Wasp.

[*Photo by P. R. Maguire.*

The species occurs in Queensland and north coastal New South Wales, being very abundant on the Tweed, Richmond, and Clarence Rivers.

It is apparently a native species, which first bred in native citrus, and later turned its attention to commercial citrus orchards, and as citrus becomes more extensively grown on the north coast the pest may assume greater proportions than at present, and may even extend to citrus areas further south.

Nature of Injury.

The injury is caused by the adult female depositing her eggs within the citrus tissues, the deposition of the eggs and subsequent larval development resulting in the formation of extensive galls on the tree (see illustration). In cases of severe infestation the greater part of the spring growth may develop into galls, which may extend continuously along the twigs for a distance of several feet, the galls sometimes reaching a diameter of an inch or more. Occasionally the galls develop only on one side of the stem, but usually they completely surround it. The uninfested portion of the twig beyond the gall continues to function for some time, and frequently abnormal shoots grow out from the galls. Infested trees if neglected present a knotted and gnarled appearance within a few seasons, and the whole condition of the trees may be affected. Thorns and, less commonly, fruit stems and even petioles of the leaves are oviposited in, resulting in the development of typical, though smaller, galls.

In the case of nursery stocks oviposition within the main stems necessitates the removal of the latter or it may render the young tree entirely useless. A noticeable feature is the irregular nature of the infestation. In two trees of the same variety side by side in an orchard, one may be heavily infested, while the other is entirely ungalled. Similarly in two orchards only half a mile apart one may show a heavy infestation, extending over a period of some years, while the other may show no signs of galling, though no control measures have been carried out.

Host Plants.

All varieties of citrus are attacked. The most severe infestation seems to occur on common lemons, which grow wild on the north coast, and some of those trees inspected at Grafton showed practically every twig infested.

Thorny mandarins are also severely infested, but grape-fruit, oranges, mandarins and lemons are also subject to attack. However, there appears to be a definite preference for certain varieties, common oranges being preferred to either valencias or navels.

Life History.

The adults, which are very short lived, emerge from the galls in the spring, chiefly during the months of October and November. They are ready to mate as soon as they emerge, and, having mated, commence to lay almost immediately. With the aid of her ovipositor the female inserts the eggs, which are about one-fiftieth of an inch in length, between the bark and the wood of twigs which have developed during the spring. Individual females lay for a few days only, the greatest number of eggs being laid during the first twenty-four hours after emergence. The last eggs are laid early in December.

The incubation period of the eggs is from two to three weeks. The first eggs hatch early in October and hatchings continue until the end of

December. The newly-hatched larva, which is translucent, white in colour, and measures about one-hundredth of an inch in length, is elongate and cylindrical, tapering towards both ends.

The first definite galls are visible externally about two months after egg deposition, and the earliest galls are usually seen in the field in late December, though galls resulting from later egg laying are usually not evident until February. The galls continue to increase in size during the summer, and are fully developed in the early winter, when the larvae within are still quite small.

The larvae develop very slowly during the summer and following winter, but commence to develop rapidly in the late winter and reach maturity in the early spring. The mature larva, which is white in colour, is elongate, cylindrical and arched, narrowing towards both ends. It measures a little over one-tenth of an inch in length, and the head and body segments are covered with a series of prominent spines.

The larvae pass into the pupal or resting stage, and from three to four weeks later the adults emerge and eat their way out of the galls to reinfest the trees.

It will be seen that the life cycle is annual. Allowing for a cycle of twelve months, the time spent in the various stages would be approximately as follows:—Egg, two to three weeks; larva, forty-five to forty-six weeks; pupa, three to four weeks. The outstanding feature of the life cycle is the great length of larval life.

Control.

At the present time the only satisfactory method of control appears to be the removal and destruction of the galls prior to the emergence of the adults. However, the removal of all the galls from heavily-infested trees will take a considerable amount of time and should be done with great care, particularly where the trees are very leafy, as smaller galls are frequently obscured by foliage.

The most advantageous time to remove the galls is also an important point. This should be done at such a time when all the females from the previous year have emerged, laid their eggs, and died, and as the galls take several months to develop the gall removal should be left until such time as all the galls are readily visible. As the last egg laying would occur in a normal year in December, cutting out of galls could be effectively carried out from March onwards throughout the winter, but prior to the time the trees commence to move in the spring. If one systematic cutting out is made at the end of the summer or early winter, the odd galls can be removed from time to time during the winter months in the course of ordinary orchard practice.

Adult wasps have been found to emerge from galls which had been removed from the trees two months earlier and kept in a dry condition, so

that should gall removal be left until the spring the greatest care must be taken to gather all the galls from beneath the trees and burn them. On no account must gall removal be carried out later than the end of August.

On account of the scattered nature of the commercial orchards in the Grafton district, a thorough careful winter removal of galls would probably ensure a fair degree of freedom from infestation for several years, particularly as the wasps do not appear to be strong fliers and therefore tend to spread slowly.

Further studies of the gall-forming wasp *Eurytoma fellis* and its parasites are in progress.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st March, 1933:—

Description.	Imports.	Exports.*
Interstate.	Cases.	Cases.
Fresh Fruit ...	355,329	61,878
Tomatoes ...	82,905	456
Bananas	15,140	42,694
	bunches.	
,, ...	94	...
	cases.	
Pines	45,923	2,992
Melons	9	...
	tons.	
,, ...	13¼	...
	dozen.	
,, ...	66	...
	lb.	
Canned Fruit ..	32,956	...
Dried Fruits—		
Unspecified ...	253,428	...
Currants ...	4,648	...
Raisins ..	37,688	...
Apples ...	448	...
Apricots ...	728	...
Prunes ...	280	...
Pears	448	...
Peaches ...	840	...

Description.	Country of Origin.	Imports.	Exports
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	62,468
Bananas ...	....	8,880	...
Lemons ...	....	741	399
Oranges ..	....	192	144
Grape Fruit ...	....	139	...
Pears	....	...	14,295
Other	....	41	4,174
Dried Fruits—		lb.	lb.
Apples ...	....	...	1,121
Apricots ...	....	...	2,208
Currants ...	....	...	10,880
Figs	Turkey ...	13,720	.
Peaches ...	....	...	192
Prunes ...	....	...	70,293
Raisins—			
Sultanas...	....	...	219,016
Lexias ...	....	...	160
Other ...	....	...	928
Dates	Egypt	550	7,711
	Iraq	657,993	...
Other	India	16,154	1,045
	China	1,239	...
Preserved in liquid—			
Apricots ...	....	...	161,724
Peaches ...	....	...	227,361
Pears ...	....	...	53,193
Pineapples ...	....	...	1,994
Raspberries	....	...	2,288
Other ...	....	...	120,470
		Gallons.	
,, ...	....	1,317	...

* Figures for exports to South Australia for March were not available and are consequently not included.

Mortality in Rabbits.

A Note on the Occurrence of *Passalurus ambiguus* (Rudolphi) in the Australian Rabbit.

GRAHAME EDGAR, B.V.Sc., Veterinary Research Officer.

During the recent plague, mortality in rabbits occurred in certain districts from time to time. This was probably due to various causes, but, in one instance at least, to the effects of invasion by internal parasites.

This mortality occurred in the Hillston district and was investigated by Mr. J. C. Beardwood, B.V.Sc., Inspector of Stock, who secured a sick rabbit and forwarded material. Bacteriological examination revealed no evidence of any bacterial condition, but the intestines showed an intense degree of parasitism. The parasite in question was a small round worm, and occurred in enormous numbers in the large bowel, over 3,000 being present. In appearance, the worm is relatively thick and short, measuring from one-fifth to two-fifths of an inch in length, but it possesses a long, fine, pointed tail. We have identified the parasite as *Passalurus ambiguus*. This worm has been recorded in Europe and America(1), and, as a matter of fact, was found to be associated with a mortality in rabbits in the Inverell district in 1923(2), though its identity was not then definitely established. The writer has examined the worms from this mortality and they are undoubtedly *Passalurus ambiguus*.

It may be mentioned that this parasite infests only rabbits and hares, sheep not being susceptible to it. On occasions, this and other worms may be responsible for extensive local mortalities in rabbits, but there is no evidence that they may cause mortalities simultaneously over a large area of the State or may even result in local extermination of the pest.

References.

(1) Yorke and Maplestone: "The Nematode Parasites of Vertebrates."
(2) Veterinary Research Report No. 1, April, 1925.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Warren	... June 7, 8	Cowra	... Sept. 12, 13
Sydney Sheep Show ...	... " 22 to 24	West Wyalong	... " 12, 13
Tullamore (W. J. Colvile)	... July 26	Barmedman...	... " 16
Peak Hill (W. R. L. Crush)	... Aug. 1, 2	Canowindra	... " 19, 20
Trundle (D. Leighton) ...	... " 8, 9	Lockhart	... " 21
Condobolin (J. M. Cooney)	... " 15, 16	Quandialla	... " 27
Gilgandra (G. Christie) ...	... " 15, 16	Hillston	... " 27, 28
Grenfell	... " 22, 23	Berrigan	... " 28
Wagga (F. H. Croaker) ...	... " 22 to 24	Hay	... " 28, 29
Bogan Gate (J. T. a'Beckett)	... " 23	Hall (F.C.T.)	... " 29, 30
Parkes (L. S. Seaborn) ...	... " 29, 30	Narrandera (J. D. Newth)	... Oct. 3, 4
Young	... " 29 to 31	Deniliquin (P. Fagan) ...	... " 4
Lake Cargelligo	... " 30, 31	Leeton (E. C. Tweedie) ...	... " 10, 11
Gosford	... Sept. 1, 2	Corowa (H. G. Norton) ...	... " 10, 11
Forbes (E. A. Austin) ...	... " 5, 6	Griffith (M. E. Sellin) ...	... " 17, 18
Murrumburrah	... " 5, 6	Cootamundra	... " 24, 25
Singleton (J. T. McMahon)	... " 6 to 8		

Fat Lamb Trials at Cowra Experiment Farm, 1932.

J. M. COLEMAN, Senior Sheep and Wool Instructor.

THE lamb trial at Cowra was conducted on similar lines to last year, and the same breeds were used. The season was a good one and excellent feed was available throughout, particularly in the autumn.

Particulars of the Mating.

The following table shows the details of the mating:—

MATING Details.

Period of mating.	Ram.			Ewe.	
	Breed.	Number used.	Percentage.	Breed.	Number used.
1st December, 1931, to 1st February, 1932.	South Down...	2	2½	Merino ...	24
				Comeback ...	27
				Crossbred ...	29
	Ryeland ...	4	2½	Merino ...	49
				Comeback ...	54
				Crossbred ...	58
	Dorset Horn...	4	3	Merino ...	36
				Comeback ...	41
				Crossbred ...	44

NOTE.—The total number of ewes mated was 109 Merino, 122 comeback and 131 crossbred.

The approximate time of mating is indicated in the following table, which shows the exact date of lambing for each type of ewe. This table shows only the ewes which lambed and does not include twin lambs.

TIME of Mating of the Different Breeds.

Week of birth.	Approximate time of service.	South Down.			Ryeland.			Dorset Horn.			All breeds.		
		Merino.	Comeback.	Crossbred.	Merino.	Comeback.	Crossbred.	Merino.	Comeback.	Crossbred.	Merino.	Comeback.	Crossbred.
April 24–30 ...	December	3	2	2	...	...	...	4	6	6	7	8	8
May 1–7	"	1	6	1	...	...	...	1	8	6	2	14	7
" 8–14... ...	"	6	5	3	3	6	5	11	11	13	20	22	21
" 15–21 ...	"	6	2	12	1	3	11	10	9	15	17	14	38
" 22–28 ...	"	...	...	1	2	5	10	4	4	3	6	9	14
" 29–June 4 ...	December-January ...	...	4	...	7	6	6	1	1	...	8	11	6
June 5–11... ...	January	1	...	2	9	10	7	...	...	...	10	10	9
" 12–18 ...	"	3	1	5	4	5	...	...	...	...	7	6	5
" 19–25 ...	"	1	1	...	2	6	5	...	...	...	3	7	5
" 26–30 ...	"	...	...	...	2	4	2	...	...	...	2	4	2

It will be noticed that practically all the ewes joined with Dorset Horn rams lambed during the first five weeks of lambing. In last year's trial the ewes joined with South Down rams all lambed during the first weeks also. On both occasions the ewes joined with these two breeds lambed earlier than those joined to the Ryeland. This fact further bears out previous experiences, which have shown that the Ryeland will mate more readily and give better results generally in a milder or cooler district.

The most striking feature of this table is the fact that the crossbred ewes again mated just as early, if not earlier, than the Merino and comeback ewes. Other trials have shown that the crossbred ewe does not mate until later; this characteristic applies particularly to the three-quarter-bred ewe.

The Lambing Percentages Favour the Dorset Horn.

The details of the lambing are as follows :—

LAMBING Details.

Breed of ram.	Breed of ewe.	No. of ewes mated.	Ewes died during lambing.	Ewes assisted at lambing.	Lambs born dead or died at birth.	No. of lambs born.	Twins.	Percentage of lambs marked.	Percentage of lambs marked from each breed of ram.
South Down	Merino ...	24	1	1	1	21	...	87·5	91·2
	Comeback...	27	...	...	...	24	3	88·8	
	Crossbred ...	29	...	1	1	28	2	96·5	
Ryeland	Merino ...	49	...	...	1	33	3	67·3	80·7
	Comeback...	54	...	1	3	47	2	87	
	Crossbred ...	58	...	1	...	50	4	86·2	
Dorset Horn.	Merino ...	36	1	2	1	33	2	91·6	96·6
	Comeback...	41	...	2	3	39	...	95·1	
	Crossbred ...	44	...	1	2	45	2	102·2	

During the 1931 trial the South Down was on top for the percentage of lambs born, but on this occasion the Dorset Horn is well in front. It will be noticed that the Merino ewe again marked the lowest percentage of lambs from each breed.

Owing to these lambs being required for ration purposes it was not possible to sell them in open market as is the usual procedure. This is most unfortunate, as no returns are available to indicate comparative values. A comparison of the quality of the lambs of the various crosses is reflected from the weights shown in the following table. These lambs, comprising six representative lambs of each cross, were sent to the abattoirs on 20th September and slaughtered and later exhibited at the Meat Industry Board's pavilion at the Royal Agricultural Society's Sydney Show.

WEIGHTS of Representative Lambs of each Cross.

Breed of ram.	Breed of ewe.	Average nett weight.	Average weight of fat.
		lb.	lb.
South Down ...	Merino	29·16	2·66
	Comeback	31·33	3
	Crossbred	32·83	3
Ryeland	Merino	27·5	2·16
	Comeback	29·33	3
	Crossbred	33·5	2·5
Dorset Horn... ...	Merino	35·33	3·33
	Comeback	36·66	3·33
	Crossbred	36·33	3·33

The wool from the ewes was sold on 31st January, 1933, and, owing to the small number of ewes, it was not practicable to keep each type of ewe's wool separate. The wool from the Merino and comeback ewes sold to 10·3d., while the crossbred wool sold to 10·2d. The four lines of Merino wool sold at 10·3d., 9·3d., 9·2d. and 9d., while the crossbred realised 10·2d., 10d. and 9·2d. After a careful perusal of the account sales, I would say that the crossbred wool sold at equal to or better prices than did the Merino.

HONEY FOR QUEENSLAND MUST BE ACCOMPANIED BY A CERTIFICATE.

UNDER Queensland regulations it is necessary for consignments of honey exported to that State to be accompanied by a certificate from the sender to the effect that the honey is entirely free from disease and has not, within the last preceding three months, been in direct or indirect contact with diseased bees, bee combs, beeswax, honey, hives or beekeepers' appliances. This certificate must also be endorsed by an Inspector of the New South Wales Department of Agriculture to the effect that the honey has been examined and is in accordance with the requirements specified under the Queensland regulations.

Up to the present quite a number of consignments have been held up in Queensland owing to the fact that they have not been accompanied by the necessary certificates. Full information regarding the issue of certificates, etc., may be obtained from the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

A BOOKLET ON TREE PLANTING.

"THE booklet *Tree Planting on the Farm* came duly to hand and I am delighted with same," writes the headmaster of a country school.

This publication was written principally for the farmer, but it is also useful as a guide to tree planting, either in the school grounds, the cottage or homestead, garden, and the park. It is priced at 1s. 1d., posted, and can be purchased from the Department of Agriculture, Box 36A, G.P.O., Sydney.

Royal Show Successes.

THE DEPARTMENT'S CATTLE AND PIGS WIN MANY PRIZES.

PUREBRED herds of the leading breeds of cattle and pigs are maintained on several of the Department's experiment farms with the idea of indicating the most suitable types and of making high-grade stock available at reasonable prices to farmers who desire to raise the standard of their stock.

This section of the Department's activities is directed by the Herdmaster, Mr. C. G. F. Grant, who has as his chief assistant Mr. A. F. Gray, Senior Piggery Instructor.

Apart from the production records established by cows in these herds from time to time, and reported in this *Gazette* (the present issue reports a world's record to Wagga Gladys), no better indication of the high standard of the Department's stock can be had than the long lists of successes each year at the Royal Sydney and other shows. Below we publish the prizes won at the recent Royal Agricultural Society's Sydney Show, and these must surely give rise to much satisfaction among those farmers who have already purchased young stock from the Department's herds; they certainly give rise to satisfaction within the Department to know that its efforts to raise the standard of the herds of the State are being attended with so much success.

Awards at the R.A.S. Show, 1933.

Beef Cattle.

ABERDEEN-ANGUS—

Champion bull, with "Blackcap Eric of Trangie."

Best pair of bulls bred in Australia, under 2 years; gold medal presented by the Aberdeen-Angus Society of Scotland.

Bull, 3 years and under 4 years; 1st prize with "Blackcap Eric of Trangie."

Bull, 15 months old and under 18 months; 3rd prize with "Trangie Prism."

Bull calf, 6 months old and under 18 months old; 1st prize with "Trangie Everard."

Bull calf, 6 months old and under 12 months old; 1st prize with "Trangie Everard."

Reserve Champion cow, with "Trangie Erica."

Cow, 4 years old and over; 2nd prize with "Blackcap Dixie 2nd" (imp., Canada).

Cow or heifer, 2 years old and under 3 years old; 1st prize with "Trangie Erica."

Heifer, 18 months old and under 2 years; 3rd prize with "Trangie Essence."

FAT CATTLE—

Fat crossbred steer, over 2 years and under 3 years; 1st prize.

Fat crossbred steer, over 18 months and under 2 years; 2nd prize.

Pen of three steers of one breed, under 2 years old; 1st prize.

Dairy Cattle.

AUSTRALIAN ILLAWARRA SHORTHORNS—

Bull, 1 year old and under 18 months; 1st prize with "Berry Justice."

Cow, in milk, 4 years old and over; 3rd prize with "Lovely 3rd of Berry."

Heifer, 18 months old and under 2 years; 4th prize with "Berry Emily."

Heifer, 12 months old and under 18 months; 4th prize with "Berry Jasmine."

Heifer calf, 6 months old and under 12 months; 1st prize with "Berry Olga."

AYRSHIRES—

Champion bull; with "Grafton Alexander."

Bull, 3 years old and under 4; 1st prize with "Grafton Alexander."

Bull, 2 years old and under 3; 1st prize with "Grafton Excelsior."

Bull, 12 months old and under 18 months; 1st prize with "Grafton Hector."

Progeny of one bull (1 male and 3 females, any age); 1st prize.

Cow in milk, 4 years old and over; 4th prize with "Grafton Dame, 6th."

Cow, dry, in calf, 3 years old and under 4; 3rd prize with "Grafton Mavis."

Cow in milk, 2 years old and under 3; 4th prize with "Grafton Honesty."

Cow or heifer, 18 months old and under 2 years; 1st prize with "Grafton Gaiety."

Heifer, 12 months old and under 18 months; 1st prize with "Grafton Carnation 2nd."

Heifer calf, 6 months old and under 12 months; 3rd prize with "Grafton Blonde 3rd."

Pen of three heifers under 2 years old; 1st prize.

Breeders trophy for best heifer under 2 years old bred and owned by exhibitor; 1st prize.

JERSEYS—

Reserve champion cow, with "Richmond Nanette."

Cow in milk, 4 years and over; 2nd prize with "Richmond Nanette."

Cow in milk, 3 years and under 4; 2nd prize with "Richmond Desert Rose, 5th"; 4th prize with "Wagge Junesse."

Pen of three cows, 2 years old and over; 2nd prize.

Best cow or heifer bred in Australia by exhibitor; 1st prize with "Richmond Nanette"; 2nd prize with "Richmond Desert Rose 5th."

Best cow or heifer bred in Australia; 1st prize with "Richmond Nanette"; 2nd prize with "Richmond Desert Rose 5th."

GUERNSEYS—

Bull, 18 months old and under 2; 1st prize with "Wollongbar Warrior."

Bull calf, 6 months, old and under 12 months; 1st prize with "Wollongbar Woodman."

Progeny of one bull (1 male and 3 females); 1st prize.

Cow in milk, 4 years old and over; 4th prize with "Wollongbar Godolphin Lass 4th."

Cow, dry, in calf, 4 years old and over; 1st prize with "Wollongbar Godolphin Lass 3rd."

Cow, in milk, 3 years old and under 4; 1st prize with "Wollongbar Godiva."

Cow in milk, 2 years old and under 3; 1st prize with "Wollongbar Molly."

Cow or heifer, 2 years old and under 3 years; 2nd prize with "Wollongbar Honour."

Heifer, 18 months old and under 2 years; 2nd prize with "Wollongbar Lillian 3rd"; 3rd prize with "Wollongbar Veracity."

Heifer calf, 6 months old and under 12 months; 1st prize with "Wollongbar Velour."

Pen of three cows, 2 years old and over; 2nd prize.

Pen of three heifers under 2 years old; 2nd prize.

PETERS' ICE CREAM BUTTER-FAT AND BREED TYPE PRIZES.*

JERSEYS—

Cow, matured, 5 years old and over; 2nd prize with "May Queen of Richmond," 91 points.

Cow, 4 years old, junior or senior; 1st prize with "Richmond Posy 5th," 89 points.

Cow, 3 years old, junior or senior; 1st prize with "Richmond Aurora," 63.34 points.

Cow, 2 years old, junior or senior; 1st prize with "Richmond Desert Rose 5th," 62.97 points.

GUERNSEYS—

Cow, matured, 5 years old or over; 1st prize with "Wollongbar Godolphin Lass 4th," 50.56 points.

Cow, 3 years old, junior or senior; 1st prize with "Wollongbar Parson's Red Rose," 60.88 points.

Cow, 2 years old, junior or senior; 1st prize with "Wollongbar Godiva," 49.83 points.

Champion Guernsey cow, with "Wollongbar Parsons' Red Rose," 60.88 points.

Pigs.

BERKSHIRES—

Sow, 9 months old and under 15 months; 1st prize.

Sow, 6 months old and under 9 months; 2nd prize.

TAMWORTHS—

Boar, 9 months old and under 15 months; 3rd prize.

Boar, 6 months old and under 9 months; 1st and 2nd prizes.

Boar, under 6 months old; 1st and 2nd prizes.

Pen of three young boars under 4 months old; 1st prize.

Sow, 9 months old and under 15 months; 2nd prize.

Sow, 6 months old and under 9 months; 1st prize.

Sow, under 6 months old; 1st and 3rd prizes.

BACON PIGS—

Pen of three young bacon pigs, any breed or cross, suitable for local consumption, bred by exhibitor; 2nd prize.

Pen of three porkers, any breed or cross, suitable for export, bred by exhibitor; 3rd prize.

*For these prizes each cow is credited with 1 point for every 6 lb. of butter-fat produced over the official standard for her respective age (junior or senior) to the extent of 60 points, and 40 points is the maximum given to any cow for breed and dairy type and constitution.

HAVE YOU A COPY OF THE "LIST OF PUBLICATIONS"?

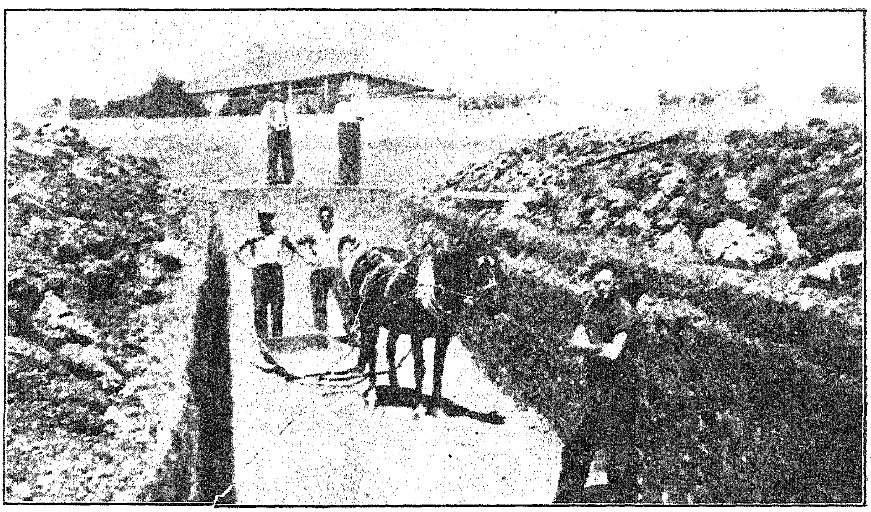
"Last week I received a number of very instructive and interesting leaflets from you, for which I thank you," writes a Gerringong (South Coast) dairy farmer. "I did not know that the Department made available so much valuable information for the man on the land until I received your 'List of Publications.'"

A copy of the List of Publications will be forwarded, free of cost, to any farmer in New South Wales. Address your request to Box 36A, G.P.O., Sydney.

Dairying Notes.

Pit Silos for the Dairy Farmer.

A FEW years back the coastal dairy farmer rather envied the inland sheepman his good fortune in being able to conserve fodder in pits. The pit was so much cheaper to construct than any other type of silo, and it turned out excellent silage, with very little waste. The belief prevalent in those times—and, unfortunately, it persists to some extent at the present time—was that the pit silo was only a success in the drier portions of the State, and that the spoilage of material in pits on the coast would be so great as to be prohibitive. Experience of recent years, however, has proved those ideas to be fallacious. Dairy farmers, even on the far north coast, where the



Excavation Work Almost Completed.

rainfall at times is torrential, are successfully conserving fodder in the pit or trench silo, so that there no longer remains any cause for envy as between the dairy farmer and the sheepman.

It is only comparatively recently that the pit silo has gained adherents in many of the far south coast districts, but even in so short a time its popularity has spread. The accompanying photographs were taken on Mr. J. Cole's farm near Pambula. This farmer was recently faced with the problems of using to best advantage 6 acres of paspalum that had, whilst spelling the paddock, grown to a height of 4 feet. Decision at first seemed to rest between grazing it off or mowing and stacking it as hay; but on the advice of Mr. John L. Green, the local agricultural instructor, it was

decided to ensile it in a pit. Mr. Cole constructed the pit 60 feet long by 10 feet wide and 6 feet deep in thirty-three hours, using plough and scoop. The estimated capacity of such a pit is about 45 tons.

Had Mr. Cole decided to graze this paddock a great quantity of the rank growth would have been left by the cows, while if he had mowed and stacked it a very large percentage of the material would have rotted in the stack. The position to-day is that this farmer has 45 tons of succulent silage safely stored, and the paddock from which the grass was cut is carrying nutritious young pasture growth.

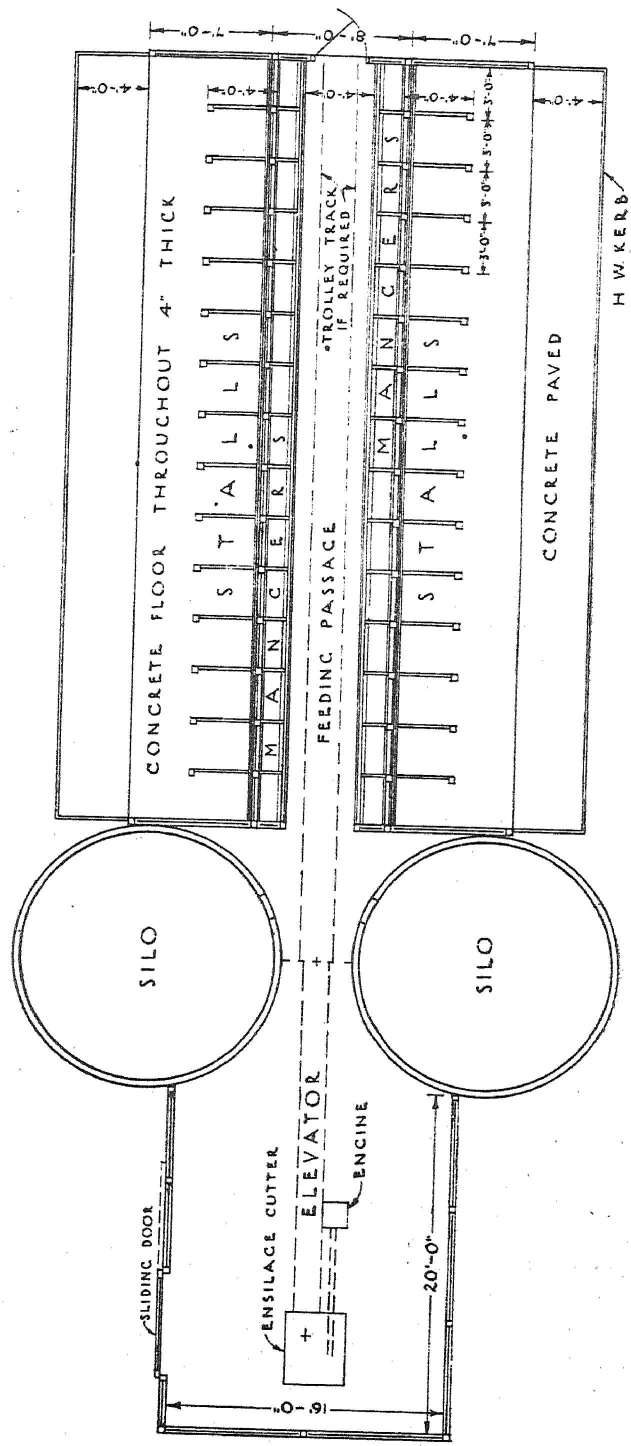
Filling the Pit Silo on Mr. Cole's Farm.

A wealth of information on pit silos—how to excavate them, fill and empty them, etc.—is contained in a free leaflet on the subject which can be had from the Department. Address your request to Box 36A, G.P.O., Sydney.

Feeding Stalls With Overhead Silo Attached.

THE conservation of fodder and the better feeding of the dairy herd are true economics for which there never was a greater call in the industry than during the present period of low prices. Even among farmers who fully realise the value of these practices there are many who sacrifice much of the advantage otherwise gained by locating their fodder reserves at points on the farm that are inconvenient.

The plans reproduced in this section offer suggestions for an economical arrangement of the overhead silo and feeding stalls. In one plan twin

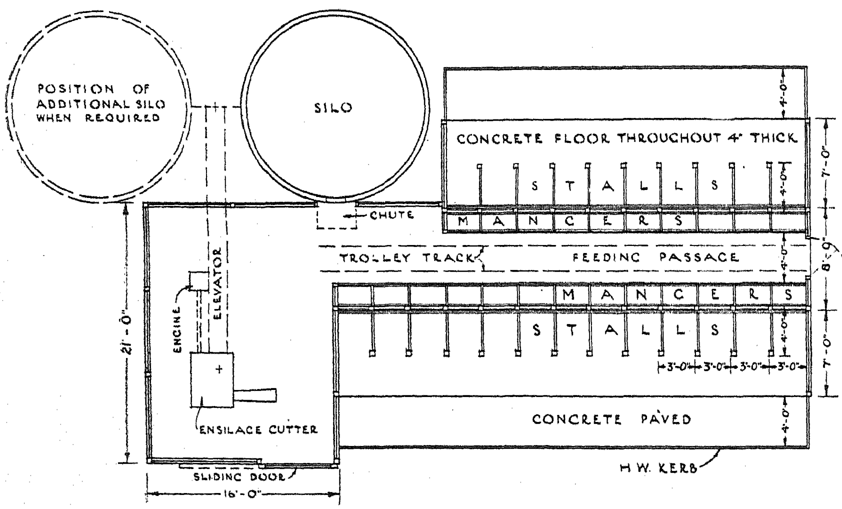


PLAN OF FEED STALLS AND SILOS

silos are shown, while in the other a single silo is shown, so situated that the later addition of a second one (indicated by dotted lines) will fit nicely into the general scheme. In planning farm building too little thought is often given to future requirements, and such shortsightedness frequently means pulling down the original structure and rebuilding it to suit later needs.

Space permitting, in our next issue it is intended to reproduce drawings of a cross-section and an elevation of these feed stalls with attached silo.

A full set of plans of dairy buildings is contained in the *Dairy Manual*



Plan of Feed Stalls with Silo Attached.
Note that provision is made for second silo when required.

(price 1s. 1d. posted), while plans and instructions for the building of overhead silos and the making and feeding of silage are to be found in the free leaflet, "Overhead Silos." Both these publications can be obtained from the Department, Box 36A, G.P.O., Sydney.

Another World's Record to Wagga Gladys.

WITH the completion of her 365 days' lactation period last month, Wagga Gladys established a world's milk and butter-fat production record for the Jersey breed. Her figures are: 22,847.5 lb. milk, of average test of 5.5 per cent., being equivalent to 1,259.66 lb. butter-fat. The record was previously held by the New Zealand Jersey cow Woodlands Felicie, with 17,332 lb. milk, equivalent to 1,220.89 lb. butter fat. During the course of her 365 days' lactation period, Wagga Gladys also established a world's production record for a 273-days' period, her figures on that occasion being 17,202 lb. milk, equivalent to 935 lb. butter-fat.

Figures for each of the twelve periods of the 365-days' test are given hereunder. The yields were calculated on a test made every thirty days, the last being calculated on a thirty-five days' basis:—

	Milk.	Butter-fat.		Milk.	Butter-fat.
	lb.	lb.		lb.	lb.
June, 1932	1,755	83·46	January, 1933 ...	1,875	110·91
July, 1932	1,785	77·28	February, 1933 ...	2,070	117·09
August, 1932	1,890	99·36	March, 1933 ...	1,995	108·30
September, 1932 ...	1,920	117·78	April, 1933	1,740	100·23
October, 1932... ...	1,845	104·16	May, 1933	2,117·5	127·61
November, 1932 ...	1,995	108·45			
December, 1932 ...	1,860	105·03	Total (365 days)...	22,847·5	1,259·66

Wagga Gladys was born on 15th October, 1919, and since first coming into the bails she has had eight lactation periods, as follows:—

	Milk.	Butter-fat.		Milk.	Butter-fat.
	lb.	lb.		lb.	lb.
1923	10,542	608	1928	14,637	790
1924	14,953	838	1929	Not Tested.	
1925	15,942	898	1931	18,005	944
1926	20,835	1,149	1933	22,847·5	1,259·66

How this world's record breaker is fed was described in the March issue of this *Gazette*—see page 223.

A Common Fault in Separators.

I HAVE reason to believe, writes Mr. V. L. Nevell, Senior Dairy Supervisor, that many dairy-farmers are induced to purchase new separators, when the major fault of the machine in use is traceable to enlargement of the indicator outlet.

Of the unledgered losses upon the dairy farm those due to faulty separation frequently receive little more than a passing thought until the matter is brought under notice by a separator salesman, who, as might be expected, is more interested in demonstrating a fault in the farmer's machine than in discovering the cause and rectifying it.

Not infrequently separators are regarded as worn out, or may even be faulty when first installed, as the result of too large an indicator cup outlet. This is situated beneath the float, and upon the size or calibre of the outlet depends the speed at which the milk enters the bowl, the function of the float being to restrict the flow of the milk from the tap and thus prevent it overflowing. It will readily be seen that a worn or enlarged outlet will permit a greater quantity of milk to enter the bowl than that part of the

machine was designed to handle, with the result that imperfect separation takes place. Periodic spurting of milk from the cream spout has also been traced to this cause.

Excessive wear of the indicator cup outlet, which usually takes the form of a short tube, is most often the result of vigorous scouring with worn brushes, the wire of which, coming into contact with the metal, rapidly wears it away.

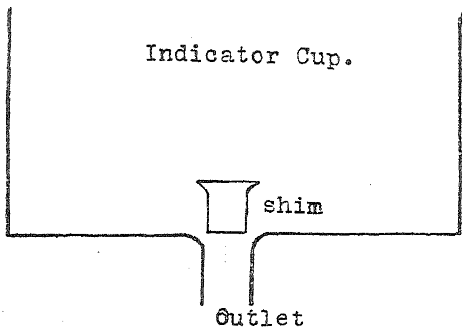


Diagram showing Shape of Shim to remedy Enlargement of Indicator Outlet.

A rough test can easily be made should enlargement of the outlet be suspected to be the cause of butter-fat losses, failure of the cream screw to raise the test, or spurting of milk from the cream spout, by inserting thin flat shims in the neck of the outlet and observing the result. The shims may be made of thin capsule tin similar to that used to seal certain types of tobacco tins and should be fashioned in the manner indicated in the diagram. One or more may be tried, and should the result justify the opinion that the outlet is too large, steps taken to reduce the size permanently.

Constriction may be effected by placing a small bell-mouthed punch over the lower end of the tube and striking, or by getting a tinsmith to re-tin heavily the internal surface of the tube, which may then be carefully reamed out to the desired size. Reaming should be done carefully, and a constant check kept upon the result by frequent tests under working conditions.

Discard Milk From Stripping Cows.

MR. A. T. R. BROWN, Senior Dairy Instructor, recently investigated the case of a dairy-farmer who was at a loss to understand the reason for his cream being consistently graded down to second grade. He found that cleanliness was observed in every operation. However, when the methylene blue test was applied to the milk from each of the thirty cows in the herd, it was found that the milk from seven was abnormal. It appeared that these seven cows were stripping cows that were only being milked once a day, and the owner had failed to observe, owing to the fact that he used milking machines, that they had got very low in milk. The point it is desired to make is that the milk from stripping cows is not fit for human consumption, and therefore should be discarded. This does not always amount to a loss, even if it is not put to some other use on the farm, as what is lost in quantity may be more than offset by the higher price returned for the better quality cream or butter.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
Liverpool State Hospital, Liverpool	72	3 June, 1933
A. D. Frater, "Fairview Dairy," Inverell	51	6 ,, 1933
W. Newcomb, "Minnamurra," Inverell	72	7 ,, 1933
Newington State Hospital and Home	100	17 ,, 1933
Riverina Welfare Farm, Yanco	89	24 ,, 1933
Department of Education, Yanco Agricultural High School	39	24 ,, 1933
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 ,, 1933
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	226	2 ,, 1933
W. Hammond, Bellingen	77	16 ,, 1933
Hurlstone Agricultural High School, Glenfield	44	22 ,, 1933
E. C. Nicholson, Jillamatong, Corowa	180	23 ,, 1933
St. John's College, Woodlawn, Lismore	47	23 ,, 1933
Grafton Experiment Farm	271	14 July, 1933
P. Ubrihien, Corridgeree, Bega	123	15 ,, 1933
William Thompson Masonic School, Baulkham Hills	37	20 ,, 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns)	100	20 ,, 1933
G. V. Ralston, "Porphyry," Seaham	98	21 ,, 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook	37	17 Aug., 1933
A. L. Logue, Thornboro, Muswellbrook	36	17 ,, 1933
E. W. Flower, Binna Burra	56	18 ,, 1933
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	43	25 ,, 1933
Sacred Heart Convent, Bowral	10	26 ,, 1933
Lunacy Department, Parramatta Mental Hospital	12	1 Sept., 1933
Department of Education, Gosford Farm Homes	38	2 ,, 1933
James McCormack, Tumut	98	9 ,, 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1933
G. Powell and Sons, "Loch Lomond," Armidale	22	26 ,, 1933
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1933
E. E. McMullen, Springnook, Holbrook	31	3 Nov., 1933
W. R. Boughton, Holbrook	33	3 ,, 1933
C. Maynard, Holbrook	12	3 ,, 1933
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1933
Stace Bros., Taylor-street, Armidale	26	1 Dec., 1933
J. L. W. Barton, Wallerawang	20	1 ,, 1933
Department of Education, Brush Farm, Eastwood	8	3 ,, 1933
Lunacy Department, Morisset Mental Hospital	29	7 ,, 1933
W. W. Martin, "Narooma," Urana Road, Wagga	150	14 ,, 1933
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1933
E. E. Winder, Wybong Road, Muswellbrook	40	22 ,, 1933
C. J. Parbery, Allawah, Bega	122	8 Jan., 1934
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay	8	9 ,, 1934
G. H. Hooper, Oak Hill, Bethungra	10	19 ,, 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys)	81	22 ,, 1934
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	13	27 ,, 1934
J. B. Burtenshaw, "Sunnyside," Inverell	42	27 ,, 1934
Parker Bros., Hampton Court Dairy, Inverell	82	27 ,, 1934
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1934
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1934
W. K. Frizell, Rosenstein Dairy, Inverell	37	2 ,, 1934
W. Pigg, Redlands Dairy, Inverell	27	2 ,, 1934
A. N. de Fraine, Happy Valley Dairy, Inverell	28	3 ,, 1934
G. L. Genge, "Easton," Armidale	39	7 ,, 1934
J. Davies, Puen Buen, Scone (Jerseys)	191	9 ,, 1934
Forster & Sons, Abington, Armidale	189	12 ,, 1934
A. B. Finney, Fox Ground, Gerringong	33	17 ,, 1934
Lidcombe State Hospital and Home	153	20 Feb., 1934
Lunacy Dept., Gladesville Mental Hospital	34	22 ,, 1934
W. J. Miller, 199 Mann Street, Armidale	7	6 Mar., 1934
New England Girls' Grammar School, Armidale	41	8 ,, 1934
F. C. Butler, Yarranung, Bega	122	24 ,, 1934
G. W. Young, "Boorganna," via Wingham	39	30 ,, 1934
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
Cowra Experiment Farm	26	27 ,, 1934
St. Joseph's Girls Orphanage, Kenmore	10	4 May, 1934
G. A. Parish, Jerseyland, Berry	93	5 ,, 1934
Marion Hill Convent of Mercy, Goulburn	27	5 ,, 1934
Australian Missionary College, Cooranbong	72	5 ,, 1934
St. Joseph's Convent, Reynold-street, Goulburn	4	5 ,, 1934

Tubercle-free Herds—*continued.*

Owner and Address.	Number tested.	Expiry date.
St. John's Boys' Orphanage, Goulburn	18	5 May, 1934
W. M. McLean, Five Islands Road, Unanderra	76	6 ,, 1934
Koyong School, Moss Vale	3	8 ,, 1934
Miss N. C. Brenan, Arankamp, Bowral	15	10 ,, 1934
Tudor House School, Moss Vale	21	13 June, 1934
St. Patrick's College, Goulburn	8	21 Sept., 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 ,, 1934
Wagga Experiment Farm (Jerseys)	60	25 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone	92	9 Nov., 1934
Wolaroi College, Orange	11	10 ,, 1934
Wollongbar Experiment Farm, Lismore (Guernseys)	123	11 Jan., 1935
George Rose, Aylmerton	2	21 Feb., 1935
Mittagong Farm Homes	36	22 ,, 1935
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	18	23 ,, 1935
T. H. Maples, Racecourse Farm, Bega	48	2 Mar., 1935
P. M. Burtenshaw, Killean, Inverell	63	28 ,, 1935
J. P. McQuillan, Bethungra Hotel, Bethungra	25	4 April, 1935
Lunacy Department, Kenmore Mental Hospital	84	4 May, 1935
St. Michael's Novitiate, Goulburn	4	4 ,, 1935
Rydalmere Mental Hospital	65	11 ,, 1935

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—Max Henry, Chief Veterinary Surgeon.

Abortion-free Herds.

The following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free.

Owner and Address.	Number in herd.
Martin Bros., "Narooma," Urana Road, Wagga Wagga	86
Cann, H. J., The Gap, Alstonville	...
McSweeney, W., The Rivers, Canowindra	169
White, F. J. and Sons, Bald Blair, Guyra	238
Mott, T., Main Arm, Mullumbimby	25

—Max Henry, Chief Veterinary Surgeon.

Infectious Diseases Reported in April.

The following outbreaks of the more important infectious diseases were reported during the month of April, 1933:—

Anthrax	Nil.
Blackleg	5
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	Nil.
Swine fever	Nil.
Contagious pneumonia	1
Necrotic enteritis	Nil.

—Max Henry, Chief Veterinary Surgeon.

Poultry Notes.

June.

E. HADLINGTON, Poultry Expert.

Brooder Sanitation.

On many farms the matter of thoroughly cleaning up the brooders and runs at the end of each season is not regarded as seriously as it should be, and often the brooding equipment is left from the end of one season till the beginning of the next without being properly cleaned and disinfected. Under such conditions it cannot be expected that chickens will thrive as they should, as diseases are likely to be carried over from one year to another, making the rearing of chickens more difficult every year. It should therefore be made a hard and fast rule that all equipment used for rearing chickens, not only the brooders but that used in all the other stages, be scrupulously cleansed as soon as possible after the end of the season.

The best procedure is to scrape and sweep all brooder parts, including outside runs, and then wash and scrub clean all interior floors and walls near the floor, using plenty of water. This should be followed by a thorough spraying with a strong disinfectant solution. It is also advisable to give a second spraying a week or so before the commencement of each season.

A factor to remember when disinfecting pens—and this is a point which does not appear to be fully recognised—is that it is next to useless to apply disinfectants to dirty surfaces, for the effectiveness of almost any disinfectant is greatly minimised if there is organic matter on the surface to which it is applied. Many farmers appear to be under a misapprehension in this connection, as frequently one sees brooders, etc., being disinfected without first being properly cleaned. In other cases the outside runs are left uncleaned after the last lots of chickens have been removed.

A practice which could with advantage be followed by more poultry farmers is to remove a few inches of soil from the outside runs every two or three years and replace it with clean new soil. This, of course, involves a fair amount of labour, but the benefit to the health of the chickens would amply compensate for the work entailed. It only stands to reason that small pens which have been in use for several years must become more or less contaminated. The growing of crops in them does not remove any harmful organisms which may be present, but, on the contrary, only serves to preserve them from year to year.

Keeping the Brooders Clean.

With the advent of wire-bottomed brooders there appears to be a growing laxity in the matter of cleaning out the brooders, and in some instances the droppings are allowed to accumulate from week to week. This does not tend towards keeping the chickens healthy, and unless more attention is paid to cleanliness the adoption of wire-bottoms will prove a delusion.

There is always a tendency to put off from day to day certain jobs which can be left, but the abuse of any labour-saving device in the rearing of chickens is likely to lead to trouble.

In the ordinary type of brooders it is advisable to clean out the heated portion every day, and here again neglect is often noted which causes an insanitary condition of the brooders. One, of course, sees instances of neglect in this respect without any harmful results, but this is no argument against cleanliness, because sooner or later trouble will arise. Therefore, the only safe course is to adopt the practice of strict cleanliness in the various stages of rearing chickens.

Hatching Operations.

In making arrangements for the chicken rearing season the capacity of the brooders in use should be carefully considered and the number of chickens to be handled should be regulated accordingly. One of the greatest evils in the rearing of chickens is overcrowding, and many poultry farmers attempt to rear far more chickens than they can properly accommodate, with the result that mortality is great, and, apart from the worry and anxiety attendant upon losses among the chickens, they end up with less pullets than would have been the case had they been content to rear less chickens. This applies particularly to beginners, who, in an attempt to establish a flock of layers as quickly as possible, over-estimate the capacity of the brooders. Others do not make allowance for the growing chickens, but base their calculations on the day-old capacity of the brooders, and consequently as the chickens grow and require more room, congestion occurs with its resultant mortality or lack of development.

Another practice which is fairly common is to either hatch or purchase chickens in large batches at the one time, and even though the brooder accommodation is not overtaxed this means that about six weeks must elapse before the next lot can be put through. This involves the provision of more accommodation in each stage of rearing than would be necessary if smaller lots were put through the brooders gradually throughout the season. It will be obvious that if the brooders are filled gradually there will be smaller numbers to provide for in the subsequent rearing stages and less accommodation would be required than when large numbers have to be transferred at one time. Furthermore, small numbers of pullets would be continually coming into production, as against a break of six weeks between the batches where large numbers are put in the brooders at one time.

Market Cockerels.

Can be Profitably Raised where Accommodation is Available.

At the beginning of the hatching season it is perhaps opportune to review the position with regard to the rearing of cockerels for market. It is safe to say that the majority of poultry-farmers, not only do not show a profit on the cockerels marketed, but make a decided loss, which has to be made a charge against the income from egg production, and in these times of low

prices for eggs there is little enough profit without further deductions in respect of a branch of operations which could be made remunerative if given more care and consideration.

The argument has been advanced that if all poultry-farmers kept their cockerels to a suitable age, the market would then be glutted with good birds and prices would be low. There is little fear, however, of such a condition of affairs arising, as there will always be a large number of poultry-farmers who have not the facilities for properly rearing the cockerel portion of the chickens, and who could not provide the necessary accommodation. It is a question then for those who are in a position to handle the business efficiently to consider whether it is worth while. In weighing up the matter consideration has to be given to the fact that a certain amount of expense is involved in rearing the cockerels to an age when their sex can be definitely determined, which, in the case of the light breeds, would be from four to seven weeks, and five to ten weeks, or even older, for the heavy breeds. The extra cost of bringing them to a marketable age, apart from feeding, is therefore chiefly in respect of interest and depreciation on additional accommodation after the brooding stage, and a little more labour.

An Export Market is Available.

During last season several of the leading poulterers in Sydney exported fairly large quantities of cockerels, principally White Leghorns, also some hens, and as far as can be ascertained the results were sufficiently encouraging to warrant an extension of operations this year. It has been stated by these firms that if birds of quality were available in large quantities there would be no difficulty in finding an outlet for them at good prices. It should be borne in mind that the flooding of the market with poorly-grown, immature birds helps to bring down prices for better-class cockerels, but if buyers could depend upon a regular supply of prime birds they could make their arrangements for export and storage, and thus absorb many more than at present.

Some Prices Realised Last Season.

Figures regarding the sale of market cockerels from the Government Poultry Farm at Seven Hills, and Hawkesbury Agricultural College, Richmond, right through from the beginning of the last selling season (October) till the end of February, will perhaps be of interest to those who wish to give consideration to producing better market birds.

The particulars given in the following table are in respect of the whole of the birds marketed, and not just special lots. Moreover, a large number of the best birds are kept on these farms for sale as stud birds, and in the case of the College a regular supply is required for table use. These birds were hatched from the middle of June to the end of September and did not receive any special treatment, but were reared on range, fed on the simple ration recommended by the Department, and marketed without topping off. They were sold in the same way as those from private farms, and observations have shown that cockerels of similar quality from private farms have realised equal prices at the same sales.

PRICES of Market Cockerels.

Date.	Pairs Marketed.	Age.	Average Live Weight per Bird.		Price per Pair.				Average Price.	
					Light Breeds (White Leghorns).					
		weeks.	lb.	oz.	s. d.		s. d.		s.	d.
Oct. 18, 1932 ...	22	16–17	3	9·1	5 10	to	7 5		6	5
,, 24 ,, ...	27½	15–17	3	6·3	4 5	to	7 5		5	9
,, 26 ,, ...	22	15–16	3	2·2	4 1	to	5 11		5	0
Nov. 2 ,, ...	22	16–17	3	7·3	4 5	to	4 10		4	7
,, 9 ,, ...	22	15–17	3	6·5	4 11	to	5 8		5	3
,, 14 ,, ...	45	15–17	3	4·4	3 11	to	5 6		4	11
,, 23 ,, ...	23	14–17	3	3·5	3 10	to	6 0		4	11
,, 28 ,, ...	20	16–17	3	9·2	4 1	to	6 6		5	8
Dec. 7 ,, ...	30	15–17	3	7·7	4 4	to	6 6		5	4½
,, 15 ,, ...	33	14–15	3	0	3 5	to	4 1		3	8¾
,, 19 ,, ...	10	15–17	3	6·4	4 0	to	6 7		5	0½
,, 21 ,, ...	22	14–15	3	0	3 3	to	4 5		3	9½
Jan. 9, 1933 ...	12	14–16	3	2	4 3	to	4 7		4	5
,, 16 ,, ...	10	16–18	4	4·8	6 0				6	0
Feb. 8 ,, ...	22	18	3	14	3 8	to	5 5		3	11
,, 15 ,, ...	80	19–20	4	3	3 0	to	5 8		4	8¾
,, 27 ,, ...	20	20	3	11·2	1 9	to	3 11		2	10½
					Heavy Breeds.					
Oct. 24, 1932 ...	5½	16–17	4	5·1	6 9	to	8 8		7	9
Nov. 16 ,, ...	18	16–17	4	7·2	5 0	to	7 11		6	3
Dec. 19 ,, ...	18	20	4	14·7	4 11	to	8 6		7	5
,, 21 ,, ...	9	18–20	4	8	5 8	to	10 6		8	4¼
Jan. 9, 1933 ...	17	18–19	4	13·2	3 3	to	8 3		6	1½
Feb. 1 ,, ...	16	22–24	5	12·5	6 4	to	8 0		7	1
,, 1 ,, ...	17	20–24	5	9·4	4 1	to	8 0		7	0½
,, 15 ,, ...	9½	20	4	12	3 8	to	4 2		3	9
,, 27 ,, ...	27	20–22	4	0	4 8	to	6 4		5	4
,, 27 ,, ...	20	20–22	3	12·3	2 8	to	4 8		4	0
,, 27 ,, ...	20	20–22	3	13·3	3 11	to	5 1		4	7½
Mar. 13 ,, ...	25	24	6	0	6 6	to	9 9		8	6
,, 15 ,, ...	10	22	4	15	4 1	to	5 0		4	6½

The cost of feeding per chicken for each four weekly period from time of hatching to twenty-four weeks old, based on prices of foodstuffs ruling last year, has been given in these Notes previously, but may be quoted again as follows:—1st four weeks, ¾d.; 2nd period, 2d.; 3rd and 4th periods, 4d.; 5th period, 4½d.; 6th period, 6d. per chicken.

It would appear that feed prices are likely to be on much the same level this year, but to enable those who so desire to make comparisons, the costs of foodstuffs upon which the figures are based are given below:—

	£	s.	d.		
Pollard and bran	6	13	6	per ton.	
Wheat	0	4	0	per bushel.	
Cracked maize	0	5	9	,,	
Kibbled wheat	0	4	9	,,	
Kibbled maize	0	6	9	,,	
Hulled oats	0	8	4	,,	(40 lb.).
Rolled oats	0	0	6	per lb.	
Milk powder	0	0	6	,,	
Bonemeal	0	0	2	,,	
Meat meal	0	0	1½	,,	

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Fallowing Methods in a Dry Summer.

COMPETITION RESULTS, 1933.

Generally speaking, the fallow period for this year's wheat crops was more than ordinarily dry in most districts, and in many instances difficulty was experienced in the preparation of a good seed-bed. In such an unfavourable season farmer's methods were tested, and those adopted by the successful competitors in this season's fallow competitions should prove helpful to wheat growers generally. The outstanding fact made evident was that a first essential to successful fallowing is a thorough understanding of the underlying principles of moisture conservation; it is not the number of workings which counts, but rather the time and nature of those workings.

The Value of Winter Fallow Appreciated in the North-West.*

THE system of short summer fallowing is peculiarly suited to the north-west, and the greater portion of the wheat grown in that district is sown on this class of fallow. The farmers of this district are aware of the desired condition of the seed-bed, and they are becoming more familiar with the peculiarities of the country, and with the methods that are necessary to achieve this result. It is pleasing to note, however, that there has been an increase in the amount of country left out to winter fallow, and this, together with the standard practice of short fallowing, will assist materially in maintaining crop returns in the district. The benefits of winter fallowing were apparent throughout the district last season, when crops grown on winter-fallowed land were able to withstand the dry conditions and produce good returns.

Fallowing exercises a good control over weed growth and fungous diseases, and at the same time conserves moisture and renders a greater quantity of plant-food available. Sheep were utilised on the fallows to minimise loss of soil moisture from weed growth.

Only one fallow competition was organised in the north-west this season, being conducted by the Gunnedah P. and A. Association. Only five fallows were entered, but these were long fallows and were in excellent condition at the time of inspection. The number of entries does not indicate the amount of fallow in the district, but the fact that no short summer fallows were entered showed that the farmers realise the importance of introducing a long fallow into the cropping system.

* J. A. O'REILLY, H.D.A., Agricultural Instructor, judged the competitions in the North-West.

The Season.

The season was such as to enable the amount of work put in on the fallows to be reduced to a minimum, and the average number of workings was 2.8.

The rainfall at two centres at Mary's Mount was as follows:—

RAINFALL Table.

	F. Adams.	A. H. Campbell.
1932.		
June	104	102
July	60	78
August	53	55
September	315	345
October	237	265
November	176	172
December	102	46
1933.		
January	485	238
February	24	16
March	38	25
Totals	1,594	1,342

The dry conditions of the winter and early spring were changed by good general rains in September and October, but the falls of November and December were mostly light. Good falls were received in January, which promoted weed growth and necessitated further working of the fallows. The weather following was mostly hot and windy, and rains up till the end of March were scanty.

The Points Awarded.

The results of the competition were as follows:—

		Points.
1.	F. Shaw, "Biwondah," Emerald Hill	131
2.	A. H. Campbell, "Beulah," Mary's Mount	129
3.	L. Griffiths, "Ballandene," Emerald Hill	126
3.	F. Adams, "Collybee," Mary's Mount	126
4.	Norrie Bros., Mary's Mount	125

At the time of judging the seed-beds were mostly dry, but subsoil moisture was present and light falls of rain would put them in good condition for sowing.

Weed Control a Factor in the Murrumburrah-Young-Monteagle District.*

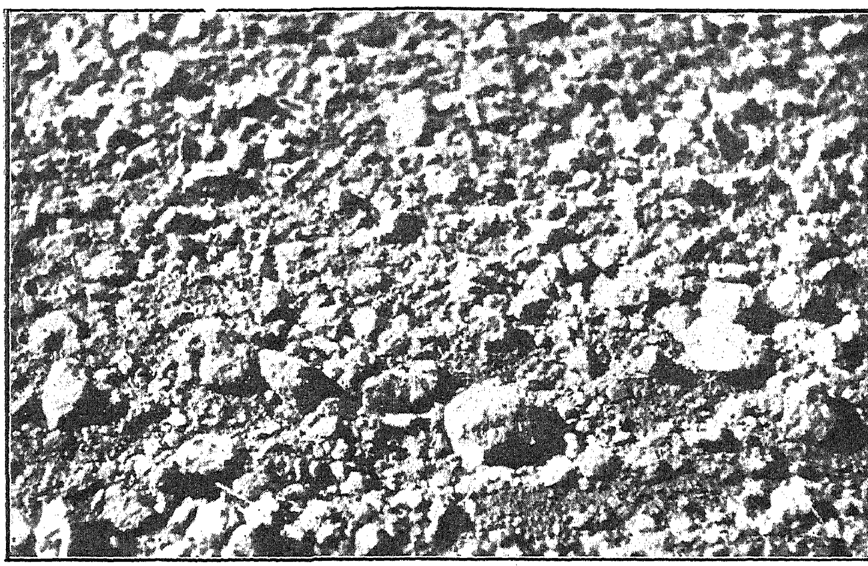
FALLOW competitions were conducted this year in this part of the south-west by the Young and Murrumburrah Agricultural Associations and by the Monteagle branch of the Agricultural Bureau.

* LEONARD JUDD, H.D.A., Manager, Temora Experiment Farm and District Instructor, and T. P. TAYLOR, H.D.A., Experimentalist, Temora Farm, judged these competitions.

The season generally was far from favourable. Good rains were experienced early in the season, allowing the initial workings of the fallows to be carried out under ideal conditions. Following harvest dry conditions prevailed, with the result that the fallows did not have any further working, and so were not in good condition.

The following rainfall registrations were recorded at Young, and may be taken as representative of Murrumburrah and Monteagle also:—August, 251 points; September, 229 points; October, 108 points; November, 347 points; December, 140 points; January, 188 points; February, nil; March, 38 points.

Weed growth, especially "Stink" grass, one of the worst weeds of fallow in this district, was troublesome. This grass makes very rapid growth during the summer months, and by using up the moisture in the soil for



An Ideal Mulch, Showing Correct Degree of "Cloddiness."

its development tends to dry out the fallow. Sheep will only eat it in the young stages, and if not then controlled it causes great inconvenience by collecting under the drill at seeding time.

The moisture content of the fallows varied considerably. This was to be expected after the dry conditions. It is interesting to note that the fallows which had the best moisture content were those that had been worked after the November rains. These workings restored the soil mulch, and by checking weed growth prevented loss of soil moisture.

Details of the Winning Fallows.

Young Competition.—Twenty-two entries were judged in this competition. Mr. H. C. Thackeray secured first place with a fallow on soil of a red loamy nature which was mouldboard ploughed 3 inches deep in July

and August, harrowed in September, and scarified in October and November. The moisture content was exceptionally high, and the fallow was very free from weed growth, and had a good mulch and a nicely compacted seed-bed.

Monteagle Competition.—Nine entries were submitted for judging in this competition. The winning entry was that of Mr. D. Cram, with soil of medium red loam, mouldboard ploughed 4 inches deep in September, springtoothed in February and again in early March. This fallow was well supplied with moisture, free from weed growth, and had a good mulch and seed-bed.

Murrumburrah Competition attracted eleven entries. First place was awarded to Messrs. R. W. Bradford and Sons for a fallow of undulating grey and red loam. This fallow was well supplied with moisture, showed a good mulch and seed-bed, and was free from weed growth. It was mouldboard ploughed 4 inches deep in August, harrowed September, springtoothed November, harrowed January, and cultivated and harrowed again in March.

The Central-western District.*

THE Crowther branch of the Agricultural Bureau conducted the only fallow competition held in this district for 1933. Six entries were received, three from Crowther, two from Bendick Murrell, and one from Koorawatha. The trophy—a handsome cup presented by the Bureau—was won by Messrs. Trengrove Bros., of Koorawatha, the award points being as follows:—

Name.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition of headlands and finishes.	Total.
Trengrove Bros. ...	28	31	33	31	8	131
Williams Bros.	32	29	28	30	9	128
Tunney Bros.	31	29	27	31	9	127
F. J. Finnis	30	29	32	26	9	126
J. F. Duffy	29	28	34	25	9	125
P. Cass and Son ...	29	30	27	28	9	123

The winning entry was a grey sandy loam of very good moisture content considering the dry summer; the rainfall from the beginning of June to end of February was 17.17 inches. This fallow had been mouldboard ploughed 4 inches deep in mid-July, harrowed first week September, springtoothed first week November, disc cultivated early in February, and springtoothed prior to judging. It was very clean and the sub-surface was very well compacted, but was somewhat uneven on the surface. The mulch was excellent on the surface but a little uneven in depth. Generally speaking it was a very good and intelligently worked fallow.

* W. D. KERLE, H.D.A., Senior Agricultural Instructor, judged the competitions in this district.

Messrs. Williams Bros.' entry was on an uneven grey to red loam in which it was difficult to maintain evenness in working. This was reflected in the subsurface and mulch, which otherwise were very satisfactory. A number of couch patches were the only weed growth, and headlands and finishes were very good. The rainfall from 1st January to judging was 225 points in excess of that of the winning entry, and more moisture was therefore present in the surface and subsoil. The fallow had been mouldboard ploughed 3½ inches to 4 inches in August, harrowed October, disc cultivated January, rigid-tined February, and harrowed early March.

Messrs. Tunney Bros.' fallow was July-August mouldboard ploughed 3½ to 4 inches, rigid-tined September and again end January. It received approximately the same rain as Messrs. Williams Bros.' entry, but did not carry as much moisture. The mulch and compactness were very good, but the presence of couch patches and a little other weed growth occasioned loss of points.

Newcomers Predominate in the Competitions Around Dubbo.*

THIS year fallow competitions were conducted by the Dubbo P.A. and H. Association (7 entries), Wellington P.A. and H. Association (5 entries), and Cumnock P.A. and H. Association (4 entries). The competitors in each district, though not numerous, were in the majority of cases new men, who had entered in order to obtain the benefit of criticism of their methods, and work—and this aspect is really the main value of fallow competitions.

An essential to the preparation of a good seed-bed is a thorough understanding of the principles of soil moisture conservation. Many farmers spoil all the good work put into the early preparation of a fallow by the use of an unsuitable implement late in the season, thus upsetting the natural or artificially created soil compaction so necessary for the production of high-yielding crops.

The Season.

The season was not an ideal one for the preparation of fallows. A dry winter resulted in many types of soil being too hard to plough satisfactorily, though a big area was initially prepared during July and August. Good rains in September allowed further ploughing to take place, and suitable workings to be given to existing fallows. Further rains early in November before harvesting operations commenced in earnest, gave further opportunities to do good work by cultivation or harrowing.

Except for isolated thunderstorms, dry conditions prevailed until March, when further workings were possible. Consequently at the time of judging the fallows at Dubbo and Cumnock, moisture content was deficient, and only to be found at a fair depth, while consolidation was frequently lacking.

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* B. M. ARTHUR, H.D.A., Senior Agricultural Instructor, judged the competitions in this district.

At Wellington rain in the interim provided sufficient moisture for requirements, but mulches were affected, as further workings had not been possible before judging.

Weed growth was generally negligible, though black thistles had to be dealt with on many of the stronger types of soils.

The Winning Fallows.

The competitors awarded first and second places in these competitions were as follows:—

RESULTS of Fallow Competitions.

District.	First Place.		Second Place.	
	Competitor.	Points.	Competitor.	Points.
Cumnock ...	Hodges Bros.	134	Miss Reilly & M. Hogan	129
Dubbo ...	R. C. Frith	133	J. P. Cullen	131
Wellington ...	J. M. Whitely & Stewart...	136	T. R. Hubbard	135

It is significant that practically all competitors in the Wellington and Cumnock districts used mouldboard ploughs for the initial working on the heavier types of soils, while at Dubbo, on generally lighter soils, the disc plough or sundercut was universally used, and one farmer commenced with a scarifying. Two of the fallows were commenced in June, six in July, five in August, and three during September.

The average number of workings given to all fallows was 3.5. Spring-tooth combines and harrows were mostly used, though several competitors used sundercut discs.

South-western Farmers Made the Most of the Meagre Rainfall.*

FALLOW competitions were conducted by the Barellan, Ariah Park, and Ungarie Agricultural Associations, and Tullibigeal and Yaddra branches of the Agricultural Bureau, the total numbers of entries being seventy-seven, a decrease of five compared with the previous year.

The Season.

Dry conditions were experienced during the summer and autumn and rendered the production of a really high-class fallow impossible. The moisture content was generally only fair, due to the fact that no really soaking rain was received during the whole fallowing period after August.

* D. V. DUNLOP, H.D.A., Agricultural Instructor, judged these competitions.

The rainfall for the fallow period at the various centres was as follows:—

RAINFALL Table.

	Barellan.	Ariah Park.	Ungarie.	Tullibigeal.	Yaddra.
1932.	Points.	Points.	Points.	Points.	Points.
July	196	176	130	113	0
August	223	231	149	151	160
September	130	132	173	191	146
October	40	98	67	60	103
November	92	79	66	93	100
December	68	125	81	28	0
1933.					
January	169	154	110	44	0
February	0	0	0	0	0
March	49	67	91	60	48
Totals	967	1,062	867	740	557

The Workings Given.

Most entries were worked satisfactorily according to the rainfall. With only two exceptions the original ploughing or scarifying had been given prior to August. All fallows had been worked following the rains of September, and again after the January falls, except those at Yaddra where no rain fell. Unfortunately the working after the January rain had been too long delayed in some cases, and a greatly increased loss of moisture could be noted in these instances. The average number of workings in all competitions was 2.5, excluding ploughing and sowing, the latter being mostly done with a combine.

An Ideal Fallow in the Riverina.
Note the cloddy condition of the surface.

Two common faults were much too great a depth in the mulch and corrugation of the seed-bed. These faults would have been remedied in all cases by an additional working in the autumn, had there been sufficient rain to justify one. Most farmers had very wisely refrained from a dry working. Naturally most fallows were very clean, the little weed growth which occurred being mostly cleaned up by sheep.

Details of the Winning Entries.

Particulars of the winning entries follow:—

Barellan Competition.—This was again divided into two sections, viz., open country and mallee, the open section attracting seventeen entries and the mallee section four. The former was won by Mr. R. A. Irvin, with an entry of heavy loam which had been mouldboard ploughed June, springtoothed July and October, combined January. The mallee section was won by Mrs. C. Ward, the cultivation given being: Mouldboard ploughed June, harrowed July, scarified November, springtoothed December and March.

Ariah Park Competition attracted twelve entries, the winner being Mr. G. G. Ballantine, whose entry of heavy brown loam was skim ploughed in June, combined September and January, harrowed March.

Ungarie Competition.—Only ten entries were judged in this competition. First place was awarded to Mr. R. D. Clark, whose land was a medium loam which had been scarified June, August, November, and March.

Tullibigeal Competition.—This competition again attracted the greatest number of entries in the district, viz., twenty-two. It was won by Mr. H. J. Harley, whose entry was disc ploughed June, scarified August and March.

Yaddra Competition was divided into two sections, viz., open country and mallee; each section attracted six entries. Mr. D. Johnson won the former section, his entry being scarified in August, springtoothed September and December. The mallee section was won by Mr. E. Fyfe, the land having been scarified in July and September.

Early Ploughing and Opportune Working Bring Success at Parkes.*

FALLOW competitions were promoted by the following organisations in this district this season:—Trundle P. and A. Association (5 entries); branches of the Agricultural Bureau at Grawlin Plains (16 entries); Fillifogi (13 entries); Dunmore (10 entries); Gunning Gap (8 entries); Coradgery (5 entries).

Seasonal Conditions Favoured Early Ploughing.

The early completion of the 1932 seeding allowed the June and July ploughing of the fallow to proceed satisfactorily, and permitted a greater area of fallow to be prepared than has been the case for several years. This asset, however, depreciated throughout the rather dry winter, and it was not until early in September that useful rain fell. The rains throughout the whole period, except for isolated storms over a very restricted area, were insufficient to benefit subsoils, and the most the farmer could do was to retain the carry-over subsoil moisture and to place the surface soil in a

* H. BARTLETT, H.D.A., Senior Agricultural Instructor, judged these competitions.

reasonably good condition. The rains of early September and late January were the only ones aiding in this work, and full advantage was taken of these opportunities.

The rainfall during the fallow period at the several localities was:—

RAINFALL Table.

	Trundle (Post Office).	Grawlin Plains (A. G. Minter).	Dunmore (Peak Hill Post Office).	Gunning Cap (W. Dwyer).
	Points.	Points.	Points.	Points.
1932—				
June	81	90	107	75
July	138	174	123	168
August	154	149	189	165
September	297	201	234	363
October	125	128	126	132
November	235	151	208	265
December	141	99	78	165
1933—				
January	56	208	260	149
February	4	35	6	40
March	68	Nil	216	Nil
Total	1,299	1,235	1,547	1,522

The Condition of the Fallows.

Except in the case of the few fallows judged after the early April rains, moisture deficiency was most marked. The lack of suitable rains restricted the fallow workings, with consequent lack of compactness of the subsurface soil and mellowness of the mulch. The two chief lessons demonstrated this year were the advantages of early ploughing upon the mulch and subsurface soil condition, and the effectiveness of a few, but opportune cultivations, upon the mellowness of the mulch. After all, it is not the number of workings that a fallow receives which determines its standard; but rather the time and nature of the essential cultivations.

The Competition Winners.

The following table gives the names of the competitors placed first, second and third in each of the competitions, and the points awarded them:—

FALLOW Competition Prize-winners.

Competition.	Placings.					
	First.		Second.		Third.	
		Points.		Points.		Points.
Trundle	Mr. N. Watt ...	137	Mr. K. Gault ...	132	Mr. C. Corke ...	131
Grawlin Plains ...	Mr. F. Wootton ...	114	Mr. C. B. Mahlo ...	113	Mr. H. H. Rath ...	106
Fillifogi	Mr. E. Kersley ...	132	Mr. C. Corke ...	131	Mr. F. Turner ... / Mr. N. Mason ...	127
Dunmore... ...	Mr. W. Swain ...	130	Mr. M. Bryant ...	128	Mr. M. Swain ...	125
Gunning Gap ...	Mr. A. A. Wyatt ...	125	Broderick Bros. ...	123	Dwyer Bros. ...	121
Coradgery ...	Mr. H. Ward ...	135	Mr. F. Davis ...	128	E. Frecklington ...	119

Pasture Improvement at Dalgety.

Lucerne and Subterranean Clover Resist Dry Conditions.

J. N. WHITTET, H.D.A., Agrostologist.

THE ability of lucerne and subterranean clover (*Trifolium subterraneum*) to withstand dry conditions was exemplified by the results obtained on "Murranumbla" station, Dalgety, during the years 1927 to 1932 inclusive.

An area of 30 acres of the subterranean clover was sown in 1927, using 2 lb. seed and 90 lb. superphosphate per acre. It germinated fairly well and thickened up in subsequent years. Since the time of planting the rainfall each year has been less than the average for the district, which is about 19 inches. In 1931 the total rainfall did not exceed 12 inches, with only one fall of over an inch, but despite this the sheep running in the subterranean clover paddock maintained their condition, while those on natural pasture were drought-stricken in appearance. During 1931 and 1932 the clover paddock carried from two and half sheep to three sheep per acre, and by September, 1932, a thick mat of growth had formed, killing out worthless plants like sorrel (*Rumex acetosella*) and tussocky poa (*Poa cæspitosa*). The paddock received no fertiliser other than that given at planting in 1927.

Lucerne, of which there is an area of approximately 150 acres on "Murranumbla" station, has also done well. It is utilised for grazing and hay production and during the dry spring and summer of 1931-32 (only 15 points of rain fell between mid-November and the first week in February) the area carried an average of two sheep per acre. Moreover, following the February, 1932 rains the lucerne was the first of the pasture plants to respond, and by the middle of March a cut of hay, averaging 12 cwt. per acre, was harvested.

Australia Demonstrates the Value of Lucerne for Grazing.

LUCERNE is one of the most drought resistant of legumes. Its use as a fodder plant is universally recognised, but its value purely as a grazing plant in semi-arid districts has probably been given greater study in Australia than elsewhere. The experimental work in some districts is of special interest in that it has been shown that lucerne sown alone at seed rates of the order of 2 lb. per acre is successful. The low seed rate seems to be of special significance under dry conditions, and such seed rates have become common practice in parts of New South Wales.—WILLIAM DAVIES, Aberysthwyth Plant Breeding Station, Wales.

It so often happens in Australia that lack of persistency in perennial rye grass is explained as being a direct function of drought, whereas all too often the real reason is that non-persistent strains have been sown.

Insure Against Drought by Conserving Fodder.

FODDER CONSERVATION COMPETITIONS, 1933.

Fodder conservation competitions were inaugurated some years back to encourage farmers to make ample provision, in times of plenty, for feeding their stock during droughty periods, and also to provide an object lesson for those less progressive men who continue to gamble with the seasons.

To accompany the judges around the farms of competitors in these competitions would provide an education and incentive to very many farmers. Unfortunately, the number of readers who find it possible to avail themselves of such an opportunity is small, but much is to be gained by a perusal of the judges' reports of local competitions. These are usually published in full in the district press, but we give hereunder a few points gathered from leading competitors in the sheep and wheat districts.

In the Wellington District.*

ON the farm of Mr. H. J. Hobden in the Wellington district there was stored sufficient fodder to feed 639 sheep for the period stipulated in the competition conditions, while the carrying capacity of the holding (600 acres) under natural grazing conditions is considered to be 600 sheep. The fodder reserves comprised 145 tons of cereal hay (mostly oaten), 87 tons of silage, 4 tons of lucerne hay, 12 tons of chaff and 9 tons of grain. Apart from quantity, it is worthy of note that Mr. Hobden provided ample variety and is able to feed a well-balanced ration to any class of stock. The precaution has also been taken on this property to protect the fodder reserves against damage by stock, mice, flood and fire. It is also a big advantage to have the reserves of fodder conveniently located on the farm to facilitate feeding, and this point has been kept in mind by Mr. Hobden.

Mr. L. Ascham, who was runner-up to Mr. Hobden in the Wellington competition, had sufficient fodder reserves to carry 1,307 sheep through the stipulated period. His property of 1,325 acres was estimated to be capable of carrying a sheep to the acre. The reserves consisted mainly of 75 tons of oat grain, 240 tons of cereal hay, 26 tons of stack silage and a quantity of chaff.

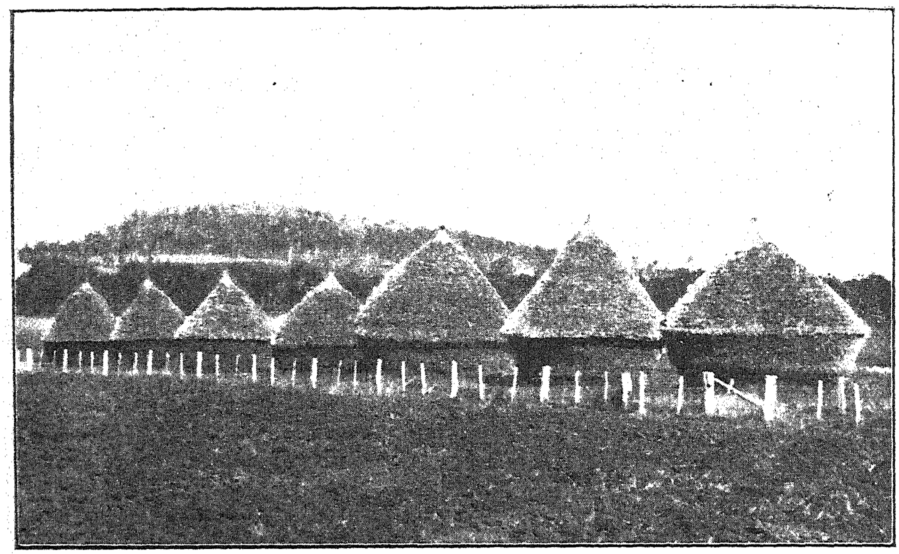
In the Ariah Park District.†

For the third year in succession Mr. D. W. Edis won the Ariah Park Agricultural Society's competition. His property comprises 820 acres, of which about 350 acres are fallowed and 350 acres cropped each year. Lucerne is established on 40 acres and 15 acres are under Wimmera rye grass. Mr. Edis' entry consisted of three pits of prime silage containing

* The Wellington competition was judged by Mr. B. M. Arthur, Senior Agricultural Instructor.

† Mr. D. V. Dunlop, Agricultural Instructor, judged the Ariah Park competition.

in all 350 tons of a mixture of oats, wheat and lucerne. Two stacks of prime oaten hay containing about 115 tons were well protected, one being built on a mouse-proof stand and well thatched, while the other was built on dunnage and surrounded by an iron fence. An iron silo contained 530 cwt. of prime oaten grain. All the conserved fodders on this farm were of excellent quality, and this point, combined with the fact that the ensilage pits and stacks were very conveniently located both from the point of view of filling and feeding, gave Mr. Edis his margin of points over the runner-up, Mr. H. W. Judd.



Well Built Stacks, but Unprotected from Mice.

Mr. Judd's fodder reserves comprised two 100-ton pits of prime oaten silage, two sheds (115 tons in all) of good quality oaten hay, and three small stacks (85 tons) of hay built on the ground and unprotected. Two iron grain silos contained 1,928 cwt. of good quality oats.

In the Trundle District.*

The winner in this district, Mr. K. Gault, of "Lynwood," Trundle, forcibly demonstrated the fact that wheat growing, if carried out on sound lines, need not decrease the stock-carrying capacity of a farm. With a holding of 1,161 acres, of which cereal crops occupy 400 acres, lucerne 10 acres, fallow 300 acres and pastures 451 acres, 700 sheep, twelve horses and seven head of cattle are carried. The normal carrying capacity of the holding, improved but under natural pasture, was estimated to be 580 sheep—one to every two acres.

* Mr. H. Bartlett, Senior Agricultural Instructor, judged the competition promoted by the Trundle P. and A. Association.

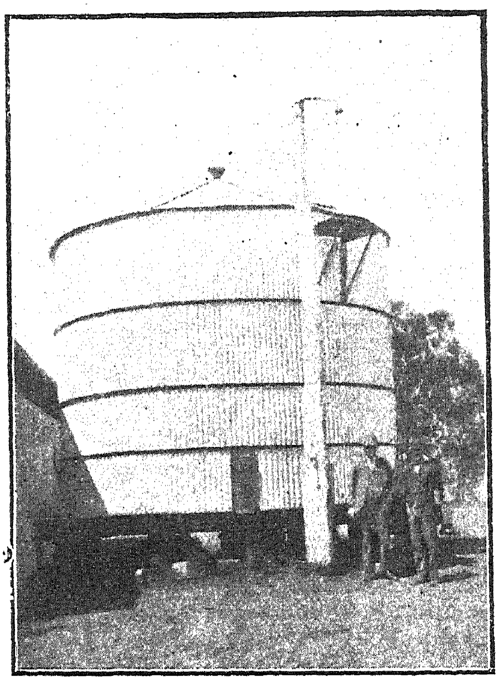
The fodder reserves consisted of 310 tons of silage, 125 tons cereal hay, 11 tons lucerne, 100 tons of grain (about 3,700 bushels of wheat). The silage is stored in three well placed and protected pits. The stack-yard encloses ten stack sites, each of about 15 tons capacity, protected by a permanent iron fence and spaced 1½ chains apart. The effectiveness of the protection against mice was well tested during the mouse plague. The wheaten grain is safely stored in four bins in bulk and the remainder in a mouse-proof shed in bags.

Mr. K. Gault was also very successful in last year's fodder competitions, winning the western district championship and following that up with the grand championship.

Mr. G. Williamson, who secured second place this year, relied almost wholly upon wheaten and oaten hay, stacked upon well-constructed straddles to protect it from mice. In addition, this competitor entered 270 bushels of stored oats.

In the North-western District.*

The dry winter and spring months of 1932 in the north-west did not encourage the storage of fodder, as growth was anything but luxuriant. However, competitions were carried out at Gunnedah and Boggabri.



A Suitable Type of Oat Grain Silo.

Messrs. Norrie Bros., who were successful in the Gunnedah competition, had sufficient fodder conserved to carry 1,156 sheep for the specified period. Their reserves consisted of wheaten and oaten hay in stacks, silage in pits, and oaten and wheaten grain in bags.

The fodder reserves of Mr. K. Vickery, who secured first place at Boggabri, comprised wheaten hay in sheaf and baled form in sheds and stacks, lucerne hay baled and loose stored in stacks and shed, and silage in pits. No grain was stored.

Competitors in the north-western district could with advantage give a little more attention to the protection of their reserves from both stock and vermin. A galvanised iron fence is useful in protecting stacks from mice. The conservation of hay in baled form has much to recommend it, as has also the storage of grain in galvanised iron tanks.

* Mr. J. A. O'Reilly, Agricultural Instructor, judged the competitions in this district.

Wheat Milling Tests.

Awards and Comments on R.A.S. Show Wheats, 1933.

G. W. NORRIS, Assistant Analyst, Chemist's Branch.

Another Record Entry this Year.

This year's record entry speaks well for the encouragement given by the promoting body (the Royal Agricultural Society) and for the advice on the cultural side given to growers by the officers of the Department of Agriculture. Year after year the entries in most classes invariably outnumber those of the previous year.

The two special classes provided this year for duplicate samples of Australian wheats sent to the World's Grain Exhibition at Regina, in Canada, created considerable interest, and even if no prizes are secured

The Milling Room, Department of Agriculture, where the Samples were Tested.

in world-wide competition, the samples entered should prove a good advertisement for Australia, in so far as they demonstrate that we can produce good-quality white wheats.

There was ample evidence that the exhibitors in this year's contest had paid much attention to the preparation of the samples entered, but factors outside the grower's control—weather conditions, etc.—resulted

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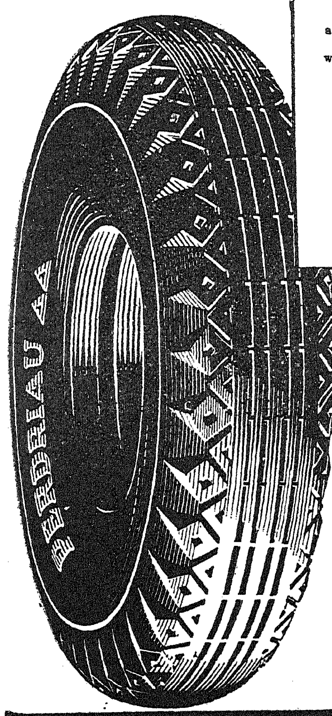

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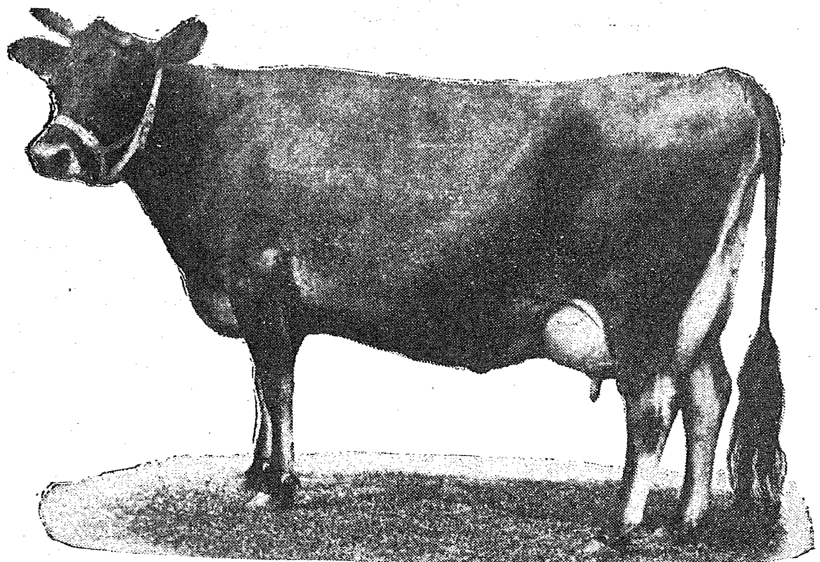


LADY TRENTON IV OF BATHURST (14083).

in some of the samples falling below show standard. This is not to be wondered at when it is considered that the samples are collected from centres over such an extensive area.

RESULTS of Milling and Flour Testing.

Cat. No.	Variety.	Appearance of grain.	Weight per bushel.		Ease of milling.	Flour.		Colour of flour.	Crude protein.		Water absorption.		Total points.
			lb.	Points.		Per cent.	Points.		Per cent.	Points.	Per cent.	Points.	
	Maximum points.	10		15	10		10	15		20		20	100
	Class 1270 (New South Wales Champion Prize).												
9455	Petatz Surprise ..	10	68½	15	10	73·0	9	14	11·5	15½	54·5	9½	83
9456	Waratah ...	8	66¾	13½	10	74·0	10	15	7·3	10½	52·2	8	75
9458	„ ...	10	68	15	10	74·0	10	14	9·1	13	52·2	8	80
9459	„ ...	8	66½	13½	10	74·0	10	13	9·3	13½	50·0	6	74
9461	Petatz Surprise ..	10	69	15	10	73·5	9½	14	9·7	13½	54·5	9½	81½
9462	Waratah ...	9	66	13	10	73·5	9½	13	9·0	13	51·3	7	74½
9463	„ ...	9	66½	13½	10	73·0	9	15	11·4	15½	53·5	9	81
	Class 1271 (Commonwealth Champion Prize).												
9469	Ford	10	67¼	14	10	73·0	9	14	10·0	14	53·75	9	80
9473	Nabawa ...	10	65½	12½	10	74·0	10	12	9·4	13½	53·75	9	77
9474	Canberra ...	10	67¼	14	10	74·0	10	13	8·4	12½	53·75	9	78½
9479	Flora	9	68½	15	10	73·0	9	15	9·6	13½	54·0	9½	81
9480	Ford	10	66¼	13	10	74·0	10	13	11·2	15	52·5	8	79
9491	Nabawa ...	8	65	12	10	75·0	10	14	9·0	13	53·5	9	76
9495	„ ...	10	65¾	12½	10	73·0	9	14	10·0	14	54·5	9½	79
9497	Ranee	10	68½	15	10	72·5	8½	13	8·0	12	53·7	9	77½
9499	Ford	10	68	15	10	74·0	10	15	11·9	16	52·0	7½	83½
9501	Florence ...	10	67	14	10	73·5	9½	14	12·2	16	55·7	10½	84
	Class 1272 (Strong White Special).												
9503	Pusa No. 4 ...	10	67¾	15	8	71·5	7½	14	12·5	16½	66·25	19	90
9504	Comeback ...	10	67½	14½	9	73·5	9½	14	12·7	16½	66·25	19	92½
9505	Pusa No. 4 ...	9	67½	14½	8	72·0	8	14	9·5	13½	67·5	20	87
9507	„ ...	10	68½	15	8	72·5	8½	15	10·7	14½	65·6	18½	89½
9512	„ ...	10	65¼	12	8	73·0	9	14	11·4	15½	66·87	19½	88
9515	Gullen	10	67¾	15	9	74·0	10	15	10·4	14½	60·0	14	87½
9516	Comeback ...	10	68½	15	9	74·0	10	14	11·6	15½	67·5	20	93½
9519	Gullen	10	67	14	9	73·0	9	15	9·5	13½	61·3	15	85½
9520	Comeback ...	9	67½	14½	9	74·0	10	12	11·0	15	67·5	20	89½
9521	Pusa No. 4 ...	10	67	14	8	72·0	8	14	12·9	17	66·25	19	90
	Class 1273 (Regina Exhibition—Medium Strong—Special).												
9523	Nabawa ...	10	65½	12½	10	74·0	10	12	9·4	13½	53·75	9	77
9525	Florence ...	9	66¼	13	10	72·0	8	15	11·0	15	55·6	10½	80½
9526	Flora	9	68½	15	10	73·0	9	15	9·6	13½	54·0	9½	81
9527	Florence ...	10	67½	14½	10	74·5	10	14	13·3	17	55·4	10½	86
9531	„ ...	9	65	12	10	73·0	9	15	11·6	15½	55·0	10	80½
9536	Ford	10	68	15	10	74·0	10	15	11·9	16	52·0	7½	83½
9537	Florence ...	10	66¼	13½	10	72·5	8½	15	11·0	15	57·5	12	84
9538	„ ...	10	67	14	10	73·5	9½	14	12·2	16	55·7	10½	84
	Class 1274 (Regina Exhibition—Strong White—Special).												
9540	Pusa No. 4 ...	10	67¾	15	8	71·5	7½	14	12·5	16½	66·25	19	90
9541	Comeback ...	9	67	14	9	73·0	9	14	11·6	15½	67·56	20	90½
9542	„ ...	10	67½	14½	9	73·5	9½	14	12·7	16½	66·25	19	92½
9543	Pusa No. 4 ...	9	67½	14½	8	72·0	8	14	9·6	13½	67·5	20	87
9545	„ ...	10	68½	15	8	72·5	8½	15	10·7	14½	65·6	18½	89½
9550	„ ...	10	65¼	12	8	73·0	9	14	11·4	15½	66·87	19½	88
9553	Gullen	10	67¾	15	9	74·0	10	15	10·4	14½	60·0	14	87½
9554	Comeback ...	10	68½	15	9	74·0	10	14	11·6	15½	67·5	20	93½
9555	Gullen	10	67	14	9	73·0	9	12½	9·6	13½	61·3	15	85½
9556	Comeback ...	9	67½	14½	9	74·0	10	12	11·0	15	67·5	20	89½
9557	Punjab	10	68	15	9	72·0	8	11½	9·0	13	67·5	20	87
9558	Pusa No. 4 ...	10	67	14	8	72·0	[illegible]	12	12·9	17	66·25	19	90

RESULTS of Milling and Flour Testing—*continued.*

Cat. No.	Variety.	Appearance of grain.	Weight per bushel.		Ease of milling.	Flour.		Colour of flour.	Crude protein.		Water absorption.		Total points.
			lb.	Points.		Per cent.	Points.		Per cent.	Points.	Per cent.	Points.	
	Maximum points.	10		15	10		10	15		20		20	100
	Class 1275 (Waratah—Special).												
9559	Waratah ...	9	66½	13½	10	73·5	9½	15	8·9	13	51·5	7½	77½
9563	,, ...	8	66½	13½	10	74·0	10	15	7·3	10½	52·2	8	75
9565	,, ...	10	68	15	10	74·0	10	14	9·1	13	52·2	8	80
9567	,, ...	8	66½	13½	10	74·0	10	13	9·3	13½	50·0	6	74
9568	,, ...	9	66	13	10	73·5	9½	13	9·0	13	51·25	7	74½
9573	,, ...	9	66½	13½	10	73·0	9	15	11·4	15½	53·5	9	81
9575	,, ...	9	67	14	10	74·0	10	15	11·6	15½	53·0	8½	82
9577	,, ...	10	67	14	10	74·0	10	15	9·2	13	53·5	9	81
	Class 1276 (Nabawa—Special).												
9579	Nabawa ...	10	67½	14½	10	75·0	10	12	10·0	14	54·5	9½	80
9580	,, ...	10	65½	12½	10	74·0	10	12	9·4	13½	53·75	9	77
9585	,, ...	8	65	12	10	75·0	10	14	9·0	13	53·5	9	76
9587	,, ...	10	65¾	12½	10	73·0	9	14	10·0	14	54·5	9½	79
	Class 1277 (Novice—Medium Strong or Soft Wheat).												
9591	Ford	10	67½	14	10	73·0	9	14	10·0	14	53·75	9	80
9599	Nabawa ...	10	65½	12½	10	74·0	10	12	9·4	13½	53·75	9	77
9603	Petatz Surprise ..	10	69	15	10	74·0	10	14	8·9	13	52·5	8	80
9606	Flora	9	68½	15	10	73·0	9	15	9·6	13½	54·0	9½	81
9607	Florence ...	10	67½	14½	10	74·5	10	14	13·3	17	55·4	10½	86
9609	Ford	10	66¼	13	10	74·0	10	13	11·3	15	52·5	8	79
9612	,, ...	9	67	14	10	73·0	9	14	9·5	13½	55·0	10	79½
9615	Nabawa ...	8	65	12	10	75·0	10	14	9·0	13	53·5	9	76
9620	Waratah ...	9	66½	13½	10	73·0	9	15	11·4	15½	53·9	9	81
9621	,, ...	9	65	12	10	73·0	9	14	9·3	13	51·5	7½	74½
9624	Ford	10	68	15	10	74·0	10	15	11·0	16	52·0	7½	83½
9626	Florence ...	10	67	14	10	73·5	9½	14	12·2	16	55·7	10½	84
9628	,, ...	10	67	14	10	73·0	9	14	10·4	14½	57·5	12	83½
9629	Waratah ...	10	67	14	10	74·0	10	15	9·2	13	53·5	9	81
	Class 1278 (Florence or Hard Federation).												
9633	Florence ...	9	66¼	13	10	72·0	8	15	11·0	15	55·6	10½	80½
9634	,, ...	10	67½	14½	10	74·5	10	14	13·3	17	55·4	10½	86
9635	,, ...	9	65	12	10	73·0	9	15	11·6	15½	55·0	10	80½
9639	,, ...	10	66¾	13½	10	72·5	8½	15	11·0	15	57·5	12	84
9640	,, ...	10	67	14	10	73·5	9½	14	12·2	16	55·7	10½	84
9641	,, ...	10	67	14	10	73·0	9	14	10·4	14½	57·5	12	83½
	Class 1279 (Weak Flour).												
9643	Petatz Surprise	10	68½	15	10	73·0	9	14	11·5	15½	54·5	9½	83
9644	Waratah ...	8	66¾	13½	10	74·0	10	15	7·3	10½	52·2	8	75
9646	,, ...	10	68	15	10	74·0	10	14	9·0	13	52·2	8	80
9647	Gluyas Early ...	9	67½	14½	10	72·5	8½	13	9·7	13½	51·6	7½	75
9648	Petatz Surprise ..	10	69	15	10	73·5	9½	14	9·7	13½	54·5	9½	81½
9649	Waratah ...	9	66	13	10	73·5	9½	13	9·0	13	51·2	7	74½
9651	Gluyas Late ...	9	66½	13½	10	72·0	8	14	9·3	13	51·2	7	74½
9656	Nizam	9	66	13	10	72·5	8½	12	8·9	13	51·6	7½	73½
9659	Bobin	8	64¾	11½	10	73·5	9½	14	9·5	13½	50·7	6½	73
9660	Petatz Surprise	10	69	15	10	73·0	9	12	9·0	13	52·0	8	77
	Class 1280 (Medium Strong—Field Wheat Competitors).												
9666	Bena	9	64	11	10	73·0	9	15	9·5	13½	55·0	10	77½
9669	Nabawa ...	10	67½	14½	10	75·0	10	12	10·0	14	54·5	9½	80
9673	,, ...	9	65	12	10	73·5	9½	15	10·0	14	52·5	8	77½
9678	,, ...	10	63¼	10	10	73·0	9	15	7·9	12	56·2	11	77
9684	Ford	9	67	14	10	73·0	9	14	9·5	13½	55·0	10	79½
9686	Nabawa ...	8	65	12	10	75·0	10	14	9·0	13	53·5	9	76
9694	Ford	10	68	15	10	74·0	10	15	11·9	16	52·0	7½	83½
9697	,, ...	10	67½	14½	10	73·0	9	15	11·0	15	54·3	9½	83
	Class 1281 (Weak Flour—Field Wheat Competitors).												
9701	Waratah ...	7	65	[illegible]	10	73·8	10	15	11·0	15	51·3	7	76
9703	,, ...	10	68	[illegible]	10	74·0	10	14	9·1	13	52·2	8	80
9704	Turvey	8	64	[illegible]	10	75·0	10	12	8·7	12½	51·5	7½	71
9711	Waratah ...	9	65	12	10	74·0	10	14	8·9	13	50·7	6½	74½
9713	,, ...	9	65	12	10	73·0	9	14	9·3	13	51·5	7½	74½
9714	Bobin	8	6[illegible]	14	10	73·5	9½	14	9·5	13½	50·7	6½	73
9716	Waratah ...	8	6[illegible]	[illegible]	10	74·0	10	15	9·6	13½	51·2	7	75½

AWARDS.

Class 1270—

First Prize, No. 9455.—W. E. Clarke; Petatz Surprise, grown at Barmedman on heavy soil; seed per acre, 35 lb.; yield per acre, 34 bushels; area sown, 70 acres; rainfall during growth, 7·33 inches; fallow.

Second Prize, No. 9461.—J. M. Gollasch; Petatz Surprise, grown at Milbrulong on red loam; seed per acre, 60 lb.; yield per acre, 29 bushels; area sown, 50 acres; rainfall during growth, 8 inches; fallow.

Class 1271—

First Prize, No. 9501.—Messrs. Wall and Carberry; Florence, grown at Narrabri on chocolate loam; seed per acre, 46 lb.; yield per acre, 19 bushels; area sown, 110 acres; rainfall during growth, 13·68 inches; autumn ploughing.

Second Prize, No. 9499.—W. E. Tonkin; Ford, grown at Pallamallawa on grey loam; seed per acre, 48 lb.; yield per acre, 47 bushels; area sown, 180 acres; rainfall during growth, 9 inches; fallow.

Class 1272—

First Prize, No. 9516.—Messrs. Pearce and Armstrong; Comeback, grown at Norpa, Merridin, Western Australia, on grey loam; seed per acre, 25 lb.; yield per acre, 12 bushels; area sown, 25 acres; rainfall during growth, 11·3 inches; fallow.

Second Prize, No. 9504.—J. K. Forrester; Comeback, grown at Carnamah, Western Australia on medium red soil; seed per acre, 50 lb.; yield per acre, 24 bushels; area sown, 50 acres; rainfall during growth, 16 inches; fallow.

Class 1273—

First Prize, No. 9527.—B. Huxley; Florence, grown at Loch Lomond, Queensland, on dark loam; seed per acre, 60 lb.; yield per acre, 27 bushels; area sown, 35 acres; no record of rain; fallow.

Second Prize, divided between No. 9537 (T. F. Upperton; Florence, grown at Castle Mountain, New South Wales, on red loam; seed per acre, 50 lb.; yield per acre, 30 bushels; area sown, 22 acres; no record of rainfall; fallow) and No. 9538 (Messrs. Wall and Carberry; Florence; seed per acre, 46 lb.; yield per acre, 19 bushels; area sown, 110 acres; rainfall during the growth, 13·68 inches; autumn ploughing).

Class 1274—

First Prize, No. 9554.—Messrs. Pearce and Armstrong, Western Australia; variety, Comeback. Other details same as No. 9516 in Class 1272.

Second Prize, No. 9542.—J. K. Forrester, with Comeback. Other details same as No. 9504 in Class 1272.

Third Prize, No. 9541.—J. Coddington; Comeback, grown at Murrumburrah, New South Wales, on red loam; seed per acre, 60 lb.; yield per acre, 21 bushels; area sown, 50 acres; rainfall during growth, 11 inches; autumn ploughing.

Class 1275—

First Prize, No. 9575.—W. Tonkin, Pallamallawa; on grey loam; seed per acre, 51 lb.; yield per acre, 42 bushels; area sown, 120 acres; rainfall during growth, 9 inches; autumn ploughing.

Second Prize, divided between No. 9573 (R. W. Peterson, Narromine, New South Wales, on black soil and chocolate loam, with clay subsoil; seed per acre, 42 lb.; yield per acre, 18 bushels; area sown, 100 acres; rainfall during growth, 7·5 inches; autumn ploughing) and No. 9577 (J. H. York, Quirindi; red chocolate loam; seed per acre, 60 lb.; yield per acre, 30 bushels; area sown, 25 acres; rainfall during growth, 14 inches).

Class 1276—

First Prize, No. 9579.—J. W. Eade, Euchareena, on chocolate loam; seed per acre, 53 lb.; yield per acre, 42 bushels; area sown, 66 acres; no record of rainfall; fallow.

Second Prize, No. 9587.—G. C. Pfitzner, Goolgowi, New South Wales; on sandy loam; seed per acre, 45 lb.; yield per acre, 30 bushels; area sown, 450 acres; no record of rainfall; fallow.

Class 1277—

First Prize, No. 9607.—B. Huxley, Loch Lomond, Queensland. Other details same as No. 9527 in Class 1273.

Second Prize, No. 9626.—Messrs. Wall and Carberry, Narrabri. Other details same as No. 9538 in Class 1273.

Class 1278—
First Prize, No. 9634.—B. Huxley, Loch Lomond, Queensland. Other details same as No. 9527 in Class 1273.
Second Prize, divided between Nos. 9639 and 9640. For details see Nos. 9537 and 9538 respectively in Class 1273.

Class 1279—
First Prize, No. 9643.—W. E. Clarke; Petatz Surprise, grown at Barmedman on heavy soil; seed per acre, 35 lb.; yield per acre, 34 bushels; area sown, 70 acres; rainfall during growth, 7·33 inches; fallow.
Second Prize, No. 9648.—J. M. Gollasch; Petatz Surprise; grown at Milbrulong on red loam; seed per acre, 60 lb.; yield per acre, 29 bushels; area sown, 50 acres; rainfall during growth, 8 inches; fallow.

Class 1280—
First Prize, No. 9694.—W. E. Tonkin; Ford; grown at Pallamallawa on grey loam; seed per acre, 48 lb.; yield per acre, 47 bushels; area sown, 180 acres; rainfall during growth, 9 inches; fallow.
Second Prize, No. 9697.—J. Wall; Ford; grown at Narrabri on chocolate loam; seed per acre, 41 lb.; yield per acre, 20 bushels; area sown, 180 acres; rainfall during growth, 13·68 inches; autumn ploughing.

Class 1281—
First Prize, No. 9701.—R. Bradford; Waratah; grown at Nubba on medium red loam; seed per acre, 60 lb.; yield per acre, 50 bushels; area sown, 50 acres; no record of rainfall; fallow.
Second Prize, No. 9703.—J. W. Eade; Waratah; grown at Euchareena on chocolate loam; seed per acre, 53 lb.; yield per acre, 44 bushels; area sown, 54 acres; no record of rainfall; fallow.

Comments on the Varieties.

Of the medium-strong varieties, Florence is easily the best, and when staged in Canada it should attract a considerable amount of attention, as it is a very clean, thin-skinned, plump grain. Upon examining the points scored, it will be seen that this variety came first in no fewer than three different classes. It is a good milling wheat, readily yielding flour rich in protein, and on this account, especially, it will command attention.

Petatz Surprise, one of the old varieties, won the New South Wales champion prize and silver cup presented by the Flour Mill Owners' Association of New South Wales. This variety once again proved its ability to top the scales, as six entries submitted averaged 68 lb., while the heaviest weighed 69 lb. per bushel.

Speaking of the strong wheats, the old Farrer wheat, Comeback, filled the first three places in Class No. 1274, and this in spite of the fact that Pusa No. 4 was strongly represented. This class contained several good samples of Pusa No. 4, other varieties worthy of note being Gullen and Punjab. Last year the prize for strong white wheats went to Mr. Huxley, of Queensland, with the variety Pusa No. 4, while this year it was won by Messrs. Pearce and Armstrong, of Western Australia, with the variety Comeback.

Acknowledgments.

Mr. C. H. Crago, of Messrs. F. Crago & Co. Ltd., Newtown, again represented the Flour Mill Owners' Association, and ably assisted in the judging of the wheats in Class No. 1270. Thanks are also due to Mr. F. J. Stokes, Chemists' Branch, for assistance given.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Sudan Grass ... ... F. and H. Owen, "Applegrove," Duri.

Potato ("Certified" and "Standard" Seed)—

Carman ... ... Secretary, Potato Growers' Association, Bannister.
Secretary, Potato Growers' Association, Millthorpe.

Early Carman ... ... Secretary, Potato Growers' Association, Millthorpe.

Early Manhattan ... Secretary, Potato Growers' Association, Millthorpe.
Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.

Factor ... ... Secretary, Potato Growers' Association, Bannister.
Secretary, Potato Section, Rural Co-operative Society Ltd., Batlow.
Secretary, Potato Growers' Association, Millthorpe.
Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Secretary, Potato Growers' Association, Taralga.

Gold Coin ... ... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.

Late Manhattan ... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.

Queen of the Valley (Standard grade only.) ... Secretary, Potato Section, Rural Co-operative Society Ltd., Batlow.

Cauliflower—

Mitchell's No. 4 ... ... C. J. Rowcliff, Old Dubbo road, Dubbo.

Cucumber—

Early Fortune ... ... W. Parry, Terrigal.

Crystal Apple ... ... E. F. Ritter, Wyong.

Beans—

Canadian Wonder ... P. Morandini, Bunglegumbie road, Dubbo.

Onion—

Hunter River Brown Spanish ... ... S. Redgrove, "Sandhill," Branxton.
C. J. Rowcliff, Old Dubbo road, Dubbo.

Hunter River White Globe ... ... C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Improved Sunnybrook Earliana ...	... A. Sorby, Macquarie Fields.
Break-o'-Day ...	... A. Sorby, Macquarie Fields. Manager, Experiment Farm, Bathurst.
Bonny Best ...	Manager, Experiment Farm, Bathurst.
Marglobe ...	
Columbia ...	
Norton	

Pea—

Greenfeast ...	... P. Morandini, Bunglegumbie road, Dubbo.

Asparagus—

Lady Washington	... Manager, Experiment Farm, Bathurst.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

It Pays to Fertilise the Early Bean Crop.

In further support of a suggestion made in the June issue of this *Gazette* to the effect that it pays to fertilise the early bean crop we give below the yields obtained in a fertiliser trial carried out last season in co-operation with Mr. C. V. B. Sampson, of Holgate, near Gosford. Here again, as in the case of the trial reported last month, a fertiliser mixture containing both phosphoric acid and nitrogen gave the best results. It will be noticed that even the least efficacious fertiliser used in the trial gave a substantial increase in yield over the unmanured plot.

Shallow drills were struck out 3 feet apart and half the amount of fertiliser shown was mixed with the soil before sowing on 16th August. The other half of the fertiliser was used as a top-dressing on 26th September.

The yields per acre were as follows:—

	Bushels.
P15 mixture (3 parts superphosphate and 1 part sulphate of ammonia), 746 lb. per acre ...	372
M22 mixture (equal parts superphosphate and bonedust), 560lb. per acre ...	348
Superphosphate, 560lb. per acre ...	346
Basic superphosphate, 700lb. per acre ...	339
P11 mixture (6 parts superphosphate and 1 part sulphate of ammonia), 652lb. per acre ...	313
P12 mixture (6 parts superphosphate and 1 part sulphate of potash), 652lb. per acre ...	307
No manure (average of two plots) ...	252

And He Was Not Misinformed.

"I would like to have the *Agricultural Gazette* sent to me each month; my neighbours inform me that it is a wonderful guide to farming," writes a farmer from the Upper Hunter district.

The *Gazette* is supplied free to all bona fide farmers.

Fertilisers Essential to Successful Tomato Growing.

Manurial Trials with Early Tomatoes, 1932–33.

A. C. ORMAN, H.D.A., Agricultural Instructor.

The manurial trials with early staked tomatoes carried out last season on the properties of Messrs. A. Sorby, Macquarie Fields, and H. Eastwood, Tascott, confirmed the results of previous years as regards the most profitable fertilisers to use. These trials also gave further backing to the contention that tomatoes cannot be grown profitably without fertilisers.

The best fertiliser practice comprises an application of M22 mixture (equal parts of superphosphate and bonedust) at transplanting time and a top-dressing with P11 mixture (six parts superphosphate and one part sulphate of ammonia) when the first bunches of fruit form. To make the first-mentioned application, drills 5 to 6 inches deep are opened up where the seedlings are to be transplanted and the fertiliser dusted along these drills and worked into the soil by means of a scarifier a few days prior to setting out the seedlings.

The Macquarie Fields Trial.

THE object of the trial with Mr. A. Sorby, Macquarie Fields, was to test out the value of P11 mixture as a top-dressing following various manurial treatments at transplanting time. The trial was sown on an elevated chocolate loam, ideally suitable for early tomato culture. Mr. Sorby's own strain of Sunnybrook Earliana was the variety used. It is a persistently heavy yielder and produces fruit of excellent quality and appearance. A crop of peas was mouldboard-ploughed under in June, the plot was cross-ploughed in July, disc-cultivated in August and harrowed down prior to planting out the seedlings on 1st September.

YIELDS in the Fertiliser Trial (Plots one-tenth of an acre).

Yield to	M22 (560 lb. per acre) and top-dressing P11 (280 lb. per acre).	P11 (652 lb. per acre) and top-dressing P11 (326 lb. per acre).	P13 (746 lb. per acre) and top-dressing P11 (373 lb. per acre).	Superphosphate (560 lb. per acre) and top-dressing P11 (280 lb. per acre).	No Manure at planting and top-dressing P11 (280 lb. per acre).	No Manure.
	Half bushel Cases.	Half bushel Cases.	Half bushel Cases.	Half bushel Cases.	Half bushel Cases.	Half bushel Cases.
15 December ...	44	44	42	40	38	27
30 December ...	27	22	18	20	16	20
Later	23	19	20	18	16	16
Total ...	94	85	80	78	70	63

NOTE.—M22 mixture contains equal parts of superphosphate and bonedust; P11 mixture, six parts superphosphate and one part sulphate of ammonia; P13 mixture, six parts superphosphate, one part sulphate of ammonia and one part sulphate of postash.

The results above indicate that 560 lb. per acre of M22 mixture at time of transplanting and 280 lb. per acre of P11 mixture as a top-dressing is the best to use for the early staked tomato crop. Worked out on an acre basis the yield of the plot given the foregoing treatment represents an increase of 90 half-bushel cases per acre over the next highest plot and 310 half-bushel cases over the "no manure" plot. It is also evident from this trial that even when plants are set out in the field without fertiliser, the yield can be profitably increased by subsequently top-dressing with P11 mixture.

Mr. A. Sorby's Early Staked Crop of Improved Sunnybrook Earliana.

Early Staked Tomatoes (Break-o'-Day)—H. Eastwood, Tascott.

The Trial at Tascott.

This trial was conducted on a light sandy soil, which has been under cultivation for some years, and is known to be badly infected with fusarium wilt. A heavy crop of Grey field peas, sown with a heavy dressing of superphosphate in March, was ploughed under in July. This class of land is naturally lacking in humus, and for best results provision has to be made to supply this all-important constituent.

The variety used in the trial was Break o' Day, a recently introduced second early, so-called fusarium wilt resister of good quality from America, the seedlings being transplanted into the field on 18th August. The plants made excellent growth up to the commencement of picking on 1st December, but from that time onwards fusarium wilt showed up and increased rapidly in severity as the hot weather advanced, necessitating an early termination of the trials on 20th December. The corn ear worm proved rather troublesome, causing serious loss. Top-dressing was carried out on the 15th November.

In view of the adverse conditions experienced by this grower, the yields obtained are highly satisfactory.

YIELDS in the Fertiliser Trial at Tascott (Plots one-tenth of an acre).

Fertiliser.	Yield to 9 December.	Yield to 20 December	Total Yield.
	Half bushel Cases.	Half bushel Cases.	Half bushel Cases.
M22 (560 lb. per acre at planting time, and top-dressing of superphosphate (4 parts) and sulphate ammonia (1 part) at 350 lb. per acre	23	46	69
M22 (560 lb. per acre, and top-dressing of superphosphate (4 parts) and sulphate of potash (1 part) at 350 lb. per acre	21	48	69
M22 (560 lb. per acre and top-dressing of superphosphate (4 parts) sulphate of ammonia (1 part) and sulphate of potash (1 part) at 420 lb. per acre	24	44	68
M22 (560 lb. per acre, and top-dressing of superphosphate (280 lb. per acre)	20	30	50
P13 (746 lb. per acre) in two applications*	23	59	82
†P12 (652 lb. per acre) in two applications*	17	50	67
Superphosphate (560lb. per acre) in two applications*	16	41	57
P11 (652 lb. per acre) in two applications*	16	38	54
M22 (560 lb. per acre) in two applications*	17	34	51
No manure	12	28	40

* Half the amount was applied at time of transplanting and half as a top-dressing.
† P12 mixture contains six parts superphosphate and one part sulphate of potash.

The results here are also in keeping with those of previous trials, an application of 560 lb. per acre of M22 mixture at planting time and a subsequent top-dressing with a mixture of four parts superphosphate and one part sulphate of ammonia, at the rate of 350 lb. per acre, proving the most profitable treatment.

The Starling.

Its Distribution and Suggestions for Control.

J. R. KINGHORN, C.M.Z.S., Zoologist* Australian Museum, Sydney.

The starling is naturally insectivorous, and on this account is regarded very favourably in most European countries; it is also declared a useful species in U.S.A. In England, however, it is now viewed with some concern, its habit of gathering in flocks being considered a grave potential danger. In Australia, although opinions are somewhat divided in different districts as to the economic value of the starling, there can be no denying that during some seasons at least it causes much damage to orchards in some districts, particularly on the irrigation areas. As a matter of fact, it was mainly because of the insistent inquiries from settlers on the Murrumbidgee Irrigation Area for reliable information as to control measures that this investigation by Mr. Kinghorn was undertaken.

The Departments of Agriculture in the various States co-operated in the collection of the information, their field officers furnishing month by month answers to queries set out in the form of a questionnaire.

Introduction and Present Distribution.

THE earliest records show that the starling was introduced into the eastern states of Australia in the "sixties" of last century. To-day it is distributed (as the accompanying map shows) over almost the whole of the cultivated lands of south-eastern Australia. Small flocks have travelled west along the transcontinental railway as far as Ooldea, and for about 300 miles north of Adelaide in South Australia. They extend eastwards from South Australia to Broken Hill in New South Wales, then south, covering the whole of Victoria, Tasmania and the eastern half of New South Wales, only a few scattered and rather small colonies being known along the Great Western railway to Bourke and along the Darling River; otherwise the whole of the drier interior of New South Wales is devoid of starlings. In Queensland the bird is restricted to the south-eastern corner, and although its exact northern limit is not definitely known, it has not yet crossed the Tropic of Capricorn.

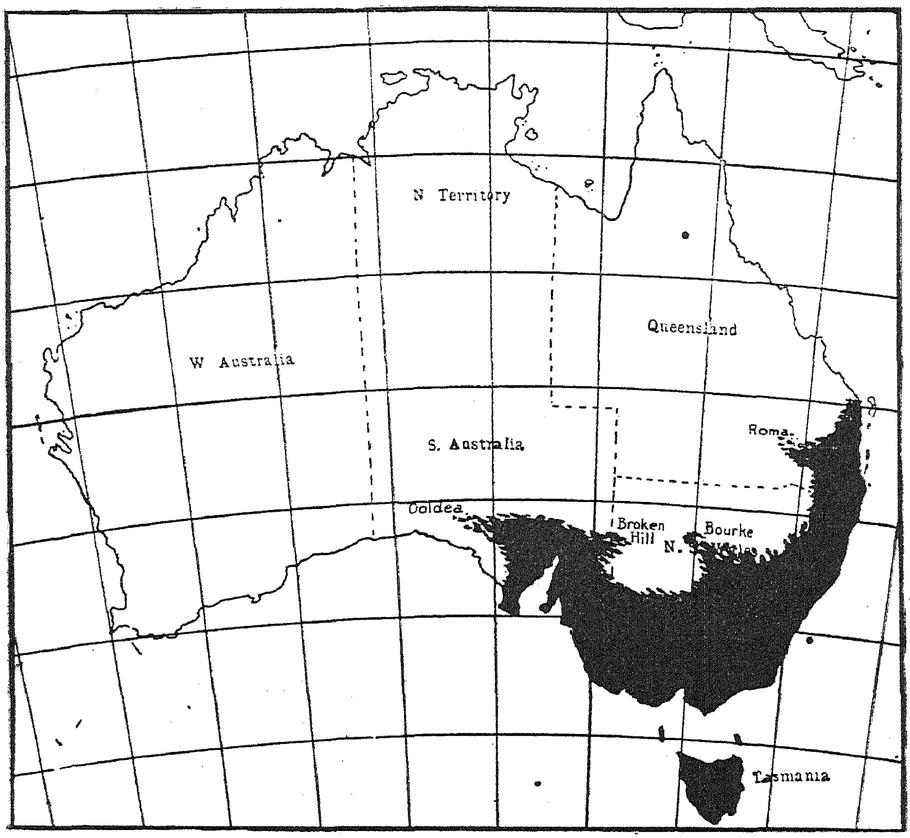
From the foregoing it would appear that hot dry climates do not suit the starling or its requirements, and that such places will never be invaded by the enormous flocks of the south-eastern portion of the continent. Apparently the starling prefers cold or temperate climates, more particularly those parts where the rainfall is above the average.

* This article is a resumé of an extensive report by the author on the distribution, migratory movements, and control of the starling (*Sturnus vulgaris*) in Australia.

Strictly speaking, the bird is not migratory, that is, it does not leave our shores for other countries. It is, however, nomadic, and apparently erratically so, as it follows no definite course, but usually times its wanderings to arrive in a district when the fruit is ripening or when grasshoppers and other insects are prevalent. Its movements are also influenced to a certain extent by weather conditions.

The Position in New South Wales.

Starlings have become very firmly established in many parts of New South Wales, excepting in the north-western areas and the drier interior, where it is very sparingly distributed.



Map of Australia showing Distribution of the Starling.

It is found in large numbers in the coastal districts in which areas it is mainly insectivorous, and, although it does attack the soft fruits at times, the damage caused is considered of little economic importance. It would appear that the moist climate of the coast, which encourages insect life, is the reason why the starlings in this portion of the State choose an insect diet.

In the districts farther inland, where the conditions are drier and insect life is not so abundant, much more damage is done to fruit. In these districts starlings are to be found in large flocks at odd intervals. They often appear when certain fruit crops are ripening and the amount of damage they do is often determined by the scarcity of the bird's more natural foods —insects and seeds.

On the Murrumbidgee Irrigation Area starlings are present in lesser or greater numbers throughout the year, the great majority roosting and nesting in the reeds and trees in the swamps. They attack most of the soft fruits, and in some orchards do a great deal of damage. At certain periods of the year they have been observed in pasture lands, feeding on grasshoppers and gorging to such an extent that they could hardly rise from the ground.

In the western districts, where sheep and wheat are the main products, starlings appear at intervals in small flocks, but, apart from nesting in houses and taking possession of nesting sites of native birds, no damage is done. A little grain is eaten, but grasshoppers, caterpillars, and insects generally form the major portion of their food. In some instances, as in Tasmania and Victoria, they have been observed picking ticks from the backs of sheep. Some of the graziers regard the starling as of some economic value as a destroyer of the larva of the blowfly.

In considering the starling's economic importance a point that has to be taken into account is its antagonistic attitude towards our native birds. It appears to be a natural aggressor, persistently driving away many of our more valuable insectivorous birds, and in addition it takes possession of all available nesting sites.

Eradication Hopeless—Control Difficult.

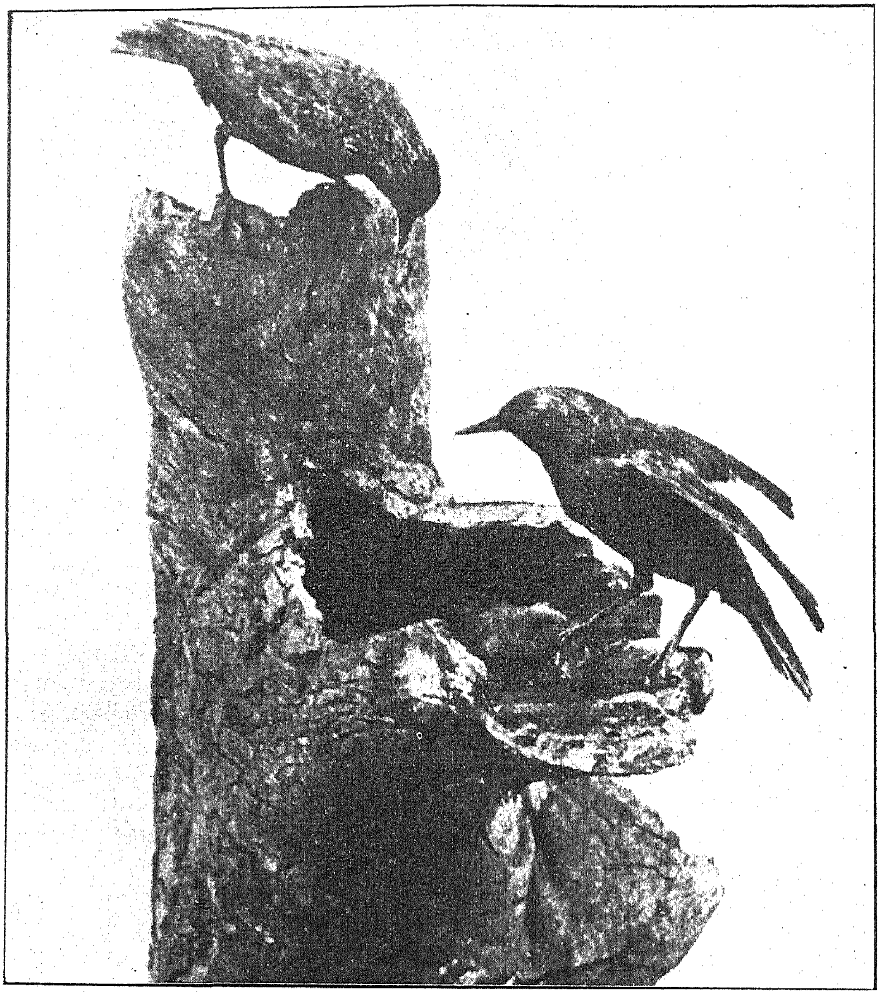
The starling is so firmly established in south-eastern Australia that its total eradication is quite beyond hope, but, although there is no known method of complete control, it can be controlled to a certain extent under favourable conditions.

Some of the people who suffer through having their fruit trees attacked make some attempt to drive the bird away, but make no move towards destroying nests in sheds and in the eaves of houses. Everything possible should be done to prevent starlings from nesting in such places by placing wire netting or boards over all cavities which might be used for nests. Nesting pairs should be shot, trapped, or poisoned, though the wholesale use of poison baits is not recommended unless the user can be certain that the bait is of such a nature, or so placed, that it will not be taken by other species of birds.

Trapping is not very satisfactory, though with continual trapping in orchards and small holdings a substantial number of birds would be destroyed. Many kinds of simple netting traps have been tried, and an

ordinary frame covered with ½ to 1 inch wire netting, or a screen ash-sifter, propped up and baited underneath, then set off with a string or trigger, has been found useful.

In places where large numbers of starlings roost they can be driven away by the firing of guns just before darkness sets in and before the birds have settled down for the night. After such roosts have been attacked for three



A Nesting Site of the Starling.

or four consecutive nights the starlings will probably leave the district. Though it is pugnacious in its attitude towards other birds, the starling is timid towards man, and where it is doing damage in orchards can be frightened by gunfire. The frequent and systematic use of the shot gun has, in some cases, effectively prevented starlings from entering orchards, while in others it has completely driven them away.

Pollination of Packham's Triumph Pear.

FINAL RESULTS OF INVESTIGATIONS AT BATHURST EXPERIMENT FARM, 1927–1932.

R. E. P. DWYER, B.Sc.Agr., Assistant Plant Breeder, and F. T. BOWMAN, B.Sc.Agr., Fruit Instructor.

In this article are detailed the results of experiments carried out at Bathurst Experiment Farm from 1927 to 1932 to investigate the reasons for the unsatisfactory cropping habits of the Packham's Triumph pear, particularly in the tableland districts.

The results point to lack of cross-pollination being the main cause of the trouble. Cross-pollination greatly improved the quantity and quality of fruit set. The average fruit set from cross-pollination was twelve times that from self-pollination. Furthermore, the self-pollinated fruits were smaller, less shapely, and more liable to drop than fruits resulting from cross-pollination.

The most suitable varieties for cross-pollination were also investigated, and recommendations based on the results are given in this article. The provision of at least one hive of bees per acre is also considered necessary to ensure maximum transference of pollen.

Introduction.

PACKHAM'S TRIUMPH is a late-ripening pear of superior eating and keeping qualities, and these valuable characteristics have earned for it a place second only to Williams (or Bartlett) in commercial importance in New South Wales. The census of fruit trees, compiled in 1928 by the Department of Agriculture, showed a total of 123,000 Williams (or Bartlett) and 72,000 Packham's Triumph trees in New South Wales. Packham's is of local origin, being first brought into prominence by Mr. Packham of Molong, New South Wales, and it quickly assumed commercial importance.

Notwithstanding the popularity and excellent qualities of this pear, many orchardists in the Bathurst and similar tableland districts have complained of the poor setting of fruit in many seasons. Pollination investigations were therefore initiated at Bathurst Experiment Farm in 1927 to determine the extent to which this variety is self-fruitful and to find the most suitable pollenisers for it. A preliminary account of these tests was published (*Agricultural Gazette,* September, 1928), and these constitute the first controlled investigations with the variety. As recorded in that article, growers in different parts of the State have had varied experiences in the fruit-setting ability of this pear, which has also shown marked variations in cropping from year to year. In the Murrumbidgee Irrigation Area and at Batlow, Lavington, and Young, as well as in the coastal areas, this variety has generally cropped satisfactorily if it was in reasonably close proximity to other varieties blossoming about the same time. On the cooler tableland districts such as Orange and Bathurst, Packham's Triumph has set very poor crops in some years under

these conditions, and its cropping is regarded as very uncertain even under the most favourable conditions in these districts. Actual self-pollination tests have proved that Packham's Triumph is naturally much more self-fruitful at Richmond (Central Coast area) than at Bathurst (Central Tableland area). Adverse environment such as frost may be an important cause of the comparatively poor setting of fruit with this variety in tableland districts, but it has been considered desirable to study the question from the standpoint of pollination.

Artificial pollination tests with this variety have now been continued for five years at Bathurst Experiment Farm, and the detailed results and conclusions of these investigations are now presented here.

The fruits obtained from self- and cross-pollination were closely examined as to shape, size and seed content. The importance of the latter lies in its correlation with shape, size, and chemical composition, and it is also the criterion by which fruitfulness and fertility are distinguished. The measure of fruitfulness is the number of fruits produced, whilst that of fertility is the viable seed content of such fruits. Fruitfulness may occur without fertility, or without any seed development at all. This condition may be one of "parthenocarpy," *i.e.*, vegetative development of the fruit without fertilisation, or of the production of seedless and imperfectly seeded fruits from causes which result in embryo abortion.

Self-pollination Results in Poor Setting.

The results of self-pollination of this variety attempted by various methods during the years 1927 to 1930, inclusive (see Table I), show Packham's Triumph to be largely self-unfruitful and to a large degree self-sterile under Bathurst conditions. A total of 7,509 blossoms were self-pollinated by bagging, caging and pollination by hand, and only 102 fruits, equivalent to an average set of 1.44 per cent., were obtained. As such a poor setting is obtained from self-pollination in this variety, it is obvious that cross-pollination with suitable varieties is necessary to obtain an adequate setting of fruit.

An examination of the few fruits derived from self-pollination showed that only a small proportion contained seeds in any number, thus indicating a low degree of self-fertility. The majority were completely seedless or of characteristically low seed content. This indicated that the self-fruitfulness of Packham's is largely the result of vegetative development of the receptacle (the pome or fruit), which may be stimulated to development by pollination without seeds being formed. It was proved, moreover, in 1927, that fruits of this variety can develop without pollination being effected at all; 197 flowers emasculated and left unpollinated produced three fruits, or 1.5 per cent., without seeds. This represents true autonomic or vegetative parthenocarpy. It must not be overlooked that death of the seed embryos and embryo abortion, principally due to the effects of faulty internal nutrition and adverse environment such as frost, may be an important cause of seedlessness in Packham's Triumph. This should not be confused with the occurrence of parthenocarpy.

The fruits obtained from selfing by caging in 1929 provided an excellent example of the low seed content which may be expected from fruits derived from self-pollinating this variety. A medium-sized, healthy tree was enclosed by a suitably constructed wooden frame 12 feet by 12 feet by 16 feet high, carefully covered with muslin to exclude bees and other insects. Three limbs on the north-eastern side were excluded from the cage, and hence were open to normal insect pollination under natural conditions. Counts on 2,973 blossoms on 384 spurs within the cage showed a set of thirty-nine fruits, equal to a setting of 1.31 per cent. All of the flowers in the cage were not included in the above count, and actually forty-two fruits were harvested from the caged section of the tree. The distribution of seeds in these forty-two fruits was as follows:—Thirty-seven fruits were seedless and the remaining five fruits contained seven seeds, equivalent to 1.4 seeds per seeded fruit; and of these five fruits two had one seed each and two had two seeds each, the remaining fruit having three seeds.

TABLE I.—Summary of Results, 1927–1932.

Pollinating Variety and Treatments.	Percentage Set at Bathurst.						Percentage Set at Richmond, 1927.
	1932.	1931.	1930.	1929.	1928.	1927.	
Self-pollination	0·0	...	4·3	1·2	1·9	1·5 * 1·2	* 11·6
Natural setting	5·2	2·5	5·0	4·0	5·2	4·0	...
Cross-pollination with—							
Williams	7·7	...	...	9·0	22·3	1·9	55·0
Baronne de Mello	...	...	...	5·3	27·0	3·2	...
Josephine	...	...	...	14·4	22·0	...	58·0
Doyenne du Comice ...	...	...	...	15·7	21·2	5·5	...
P. Barry	...	...	...	...	3·1	0·0	...
Clapp's Favourite	...	...	...	...	...	...	40·0
Beurre Clairgeau	...	...	...	7·8	...	...	...
Beurre d'Anjou	...	...	9·7	10·5	...	...	...
Beurre Superfine	...	...	19·5	8·7	...	...	...
Madame Henri Desportes ...	...	32·0	9·3	...	...	...	...
Winter Cole	...	...	8·4	...	...	...	...
Howell	...	45·0	...	...	...	...	...

* Self-pollination by bagging.

On examination, the seedless and imperfectly-seeded fruits of Packham's Triumph are mostly misshapen and malformed. This fact, apart from the diminished crop obtained when conditions or facilities for cross-pollination are inadequate, provides clear evidence of faulty pollination in this variety.

Many investigators have shown, and tests at Bathurst also indicate, that progressive increase in the weight of the fruit is correlated with increased seed content. This is thought to be due to the stimulation which the developing seed exercises in the conveyance of nutriment to the fruit, with the consequent increase in size. This fact is well illustrated in the greater tissue development in fruits of low and uneven seed content on the sides containing seeds, leading to imperfectly shaped and lop-sided

fruits. It is also illustrated in pears where a many-seeded fruit has a well developed base and small neck, whilst a few-seeded fruit has a comparatively small base and thick neck.

In determining the self-fruitfulness and self-fertility of any variety, the various methods of self-pollination employed must be given consideration. Different results are obtained by the use of different methods, such as caging with or without bees, covering the flowers with glassine bags without further treatment, and artificial pollination of the covered flowers with or without emasculation. The results obtained by some methods alone may not be a correct indication of the true degree of self-fruitfulness. Experiments at Bathurst have shown that trees caged under muslin are usually more self-fruitful than when blossoms are bagged in glassine bags on open trees without further treatment. This is probably due to differences in the environment of the flowers and in the nutritional conditions under which the fruits develop in each case. Artificial self-pollination increases the set in both instances. The results of the various methods of determining self-fruitfulness employed at Bathurst are set out in Table II.

TABLE II.—Self-pollination Results and Comparison of Methods.

Method of Self-pollination.	Year.	No. of spurs.	No. of blossoms.	No. pollinated.	No. set.	Percentage set.	Fruits per 100 spurs.	Remarks on seed content.
Bagging	1927	...	493	...	6	1·22	...	....
,, ...	1928	...	1,504	...	28	1·86	...	....
,, ...	1929	130	985	...	7	0·71	5	All seedless.
Total bagging	...	...	2,982	...	41	1·38	...	Mainly seedless.
*Hand self-pollination	1929	...	...	863	13	1·51	...	2 fruits seedless.
,, ,, ...	1929	...	...	56	1	1·79	...	....
,, ,, ...	1930	45	416	185	8	4·32	17	3 seeds only.
,, ,, ...	1932	40	343	263	0	0·00	...	....
Total	...	...	...	1,367	22	1·61	...	....
Caging	1929	384	2,973	...	39	0·71	10	34 seedless, and 5 fruits with 7 seeds.
Total all selfing methods ...	...	...	†5,955 + 1,367 = 7,322		102	1·39	...	....

Results of 1929 Self-pollination.

Method of Self-pollination.	Year.	No. of spurs.	No. of blossoms.	No. pollinated.	No. set.	Percentage set.	Fruits per 100 spurs.	Remarks on seed content.
Hand pollination—								
Inside cage	...	...	236	...	7	3·0	...	....
Open trees	...	...	627	...	6	0·95	...	....
Bagging—								
On limbs excluded from cage	...	27	223	...	7	3·14	26	All seedless.
On other trees	...	103	762	...	0	0·00	0	....

* Spur-unit method—Packham's Triumph selfed on same cluster as P.T. x some other variety.
† Total of bagging and of caging.

The Natural Setting is Variable.

The comparison of the natural set of Packham's Triumph for different years and on different trees (given in Table III) yields some interesting information. It is seen that the percentage natural set varies between different trees even of the same age, and also between young and old trees.

Results with Packham's Triumph pear, as with Williams (or Bartlett) also show that a higher natural set of fruit was obtained on the limbs excluded from the cage already mentioned, than from trees which were wholly exposed to open pollination. In every case also a higher set of fruit resulted from flowers selfed by bagging on these limbs than was obtained on trees wholly exposed. A similar increase in fruit setting was recorded when flowers were emasculated and artifically crossed on these limbs.

It is evident that self- and cross-fruitfulness are closely correlated with the fluctuations of the natural set, all being an expression of the vigour of the tree and the competition between developing fruits, or, in other words, internal nutritional conditions.

TABLE III.—Packham's Triumph, Natural Sets.

Year.	Number of Trees.	Age in years.	No. of blossoms.	No. set.	Percentage set.	No. of spurs.	Fruit per 100 spurs.
1927	Four trees...	...	2,360	95	4·03	...	...
1928	First lot of young trees	8	1,138	23	2·02	...	...
	Second lot of young trees ...	8	441	45	10·20	...	...
	Total for young trees ...	...	1,579	68	4·30	...	...
	An old tree	22	493	40	8·11	...	...
	Total for 1928	...	2,072	108	5·21	...	...
1929	A tree	24	1,183	44	3·72	130	30
	B tree	9	1,575	47	3·10	292	16
	On limbs excluded from cage ...	9	1,418	72	5·08	186	39
	Total for 1929	...	4,116	163	3·96	608	27
1930	Total for 1930	10	3,740	185	4·95	436	42
1931	Total for 1931	11	968	24	2·48	133	18
1932	Total for 1932	12	2,513	130	5·17	285	46
	Total for period 1927–32 ...	...	15,769	705	4·47	...	...

As would be expected, the average natural setting varies somewhat in different years. The natural set of the season 1931 is worthy of special mention. The pollination conditions of the blossoming time of Packham's Triumph were distinctly adverse, as cold, moist weather largely prevented bees from working and caused low germination of the pollen. In addition, an early record invasion of thrips caused serious injury to the majority of the flowers. The resultant crops from most varieties of pears were poor, and except for a few varieties the apple crop was practically a failure. However, the heaviest commercial setting of Packham's Triumph for at least the last three seasons was harvested following these conditions, although the natural set counted on 968 blossoms did not indicate this. Whilst the conditions did not favour pollination, they apparently favoured vegetative development of the fruit, as it was found that a high proportion

of the fruit was without, or had only undeveloped, seeds. The favourable moist conditions allowed the heavy crop to mature, though at least 25 per cent. was undersized, misshapen and unsaleable. This clearly demonstrated the important relationship of seedlessness, due to embryo abortion or to other causes, and of parthenocarpy, to fruit setting under some conditions, and also the importance of seed development to size and saleability of the fruits.

Suitable Cross-pollination is Necessary for Adequate Setting.

The importance of adequate cross-pollination for increasing the fruit set is indicated by the results given in Table IV, in which a comparison is made of the results of natural setting and of all artificial self- and cross-pollination of Packham's Triumph at Bathurst Farm for the years 1927 to 1932, inclusive.

TABLE IV.—Natural Set, Self- and Cross-pollination Compared for Five Years (1927–1932 inclusive.)

	No. of blossoms used.	No. of fruits set.	Percentage of fruits set.
Natural set	15,769	705	4·47
Self-pollination (all methods)*	7,322	102	1·39
Cross-pollination (all methods) ...	4,571	758	16·58

* No self-pollination in 1931.

It will be seen that cross-pollination with suitable varieties increased the fruit set twelvefold over that obtained from self-pollination by all methods. In contrast to the fruits obtained from self-pollination the crossed fruits were mainly well-seeded (see Table V), thus indicating the effect of cross-pollination on the seed content, which, as previously stated, influences the size and shape of the resultant fruits.

These results clearly demonstrate that cross-fertilisation is essential for maximum commercial cropping, and show the necessity for efficient arrangements for cross-pollination in the Packham's Triumph pear. It will be seen that under the conditions at Bathurst, the percentage of fruit set from artificial cross-pollination of this variety was four times as great as the natural set, counted over the five years of testing.

The natural set of Packham's Triumph, which is shown to average only 4 per cent. over six years, is somewhat low to constitute satisfactory cropping in the Bathurst district. The pollination facilities of the block of this variety at Bathurst Experiment Farms consist of a number of varieties on the eastern side only, some of which, such as Josephine, Howell, Beurre Superfine and Baronne de Mello, blossom approximately at the same time at Packham's Triumph. The set obtained under these circumstances indicates the necessity for a proper arrangement of inter-pollinating varieties when planning the planting of an orchard.

Natural Setting and Artificial Crossing Compared.

The difference between the natural set and the results of artificial crossing are sufficiently great to require some explanation, and the following are some factors which may be responsible:—

1. The selection of suitable varieties when pollinating which may not have been in close proximity to the trees worked with.

2. Pollination is more efficient in artificial crossings than where natural conditions prevail, as the insect agency may not be sufficiently active for good pollination. This may be offset by the fact that bees are capable of repeatedly pollinating the same flower.

3. Selection of the blossoms at the correct stage and in the best condition when pollinating artifically.

4. Under hand-pollination conditions fewer blossoms are used to a given length of limb, and these are more likely to persist owing to internal nutritional conditions.

5. There is, undoubtedly, a much greater proportion of self-pollination and vegetative development of the fruits under natural pollination (see discussion of 1931 season crop on page 520) than under hand-pollination conditions, especially when the conditions at blossoming time are adverse.

As indicated previously, the fruits resulting from self-pollination of Packham's have a low seed content compared with those resulting from cross-pollination. Investigators in other countries have established the fact that seedless fruits or fruits of low seed value are first to drop in competition with well-fertilised many-seeded fruits during the natural sheddings. Thus the proportion of self-pollination is an important factor in determining the difference between the natural set and the results from artificial cross pollination.

The facts outlined here demonstrate the need to eliminate self-pollination and to obtain as high a proportion of cross-pollination as possible. Because of the trouble experienced in obtaining adequate setting of Packham's Triumph pear at Bathurst and in other tableland districts, more attention must be devoted to this aspect of orchard practice in such localities.

Suitable Varieties for Cross-pollination of Packham's Triumph.

Of the varieties tested at Bathurst (see Tables I and V) P. Barry appears to be definitely unsatisfactory as a polleniser for Packham's Triumph. Some earlier tests included Windsor and Jargonelle, and these also appear unsuitable for this purpose.

The other varieties used all satisfactorily pollinated Packham's Triumph. Accompanying this was a high seed complement in the crossed fruits, except for two instances in 1930 which were probably due to bad pollination conditions and injury to the blossoms by thrips. The following varieties effectively cross-fertilised Packham's over the period of test:—Williams (four years), Josephine and Baronne de Mello and Doyenne du Comice

(three years), Beurre d'Anjou, Beurre Superfine and Madame Henri Desportes (two years), Clapp's Favourite (at Hawkesbury College), Howeli and Winter Cole (in one year's test only).

TABLE V.—Cross-pollination Results 1927-32.

Packham's Triumph.	Farm.	Year.	No. of blossoms.	No. pollinated.	No. set.	Percentage set.	Seeds.	No. of seeds per fruit.	No. germinated.	No. of spurs.	Fruit per 100 spurs.
x Williams ...	Hawkesbury College.	1927	...	100	55	55·00	...	...	...	...	...
	Bathurst Experiment Farm.	1927	...	160	3	1·88	...	...	...	...	...
		1928	...	215	58	22·32	232	4·0	196	...	...
		1929	...	468	44	9·40	165	3·8	35	...	...
		1932	429	337	26	7·71	...	...	...	53	50
x Beurre Superfine	,, ...	1929	...	138	12	8·69	87	7·2	16	...	...
		1930	315	159	31	19·50	115	3·7	...	38	82
x Baronne de Mello	,, ...	1927	...	220	7	3·18	...	...	...	...	...
		1928	...	148	40	27·03	172	4·3	137	...	...
		1929	...	198	10	5·29	72	7·2	...	...	...
x Doyenne dn Comice.	,, ...	1927	...	146	8	5·48	...	...	...	...	...
		1928	...	132	28	21·21	187	6·6	105	...	...
		1929	...	89	14	15·73	117	8·3	22	...	...
x Josephine ...	Hawkesbury College.	1927	...	100	58	58·00	...	...	...	...	...
	Bathurst Experimental Farm.	1928	...	177	49	22·04	192	4·0	175	...	...
		1929	...	257	37	14·40	239	6·5	27	...	...
x Beurre d'Anjou...	,, ...	1929	...	190	20	10·53	73	3·6	7	...	...
		1930	391	206	20	9·71	18	0·9	...	45	44
x Beurre Clairgeau	,, ...	1929	...	77	6	7·79	37	6·2	4	...	...
x Madame Henri Desportes.	,, ...	1930	669	324	30	9·26	40	1·3	...	76	39
		1931	252	137	45	32·85	120	3·8	...	27	170
x Howell	,, ...	1931	479	215	97	45·12	342	3·5	...	63	154
x Clapp's Favourite	,, ...	1927	...	112	45	40·18	...	...	...	...	...
x P. Barry ...	,, ...	1927	...	48	0	0·00	...	...	...	...	...
		1928	...	64	2	3·11	...	...	...	...	...
x Winter Cole ...	,, ...	1931	260	154	13	8·44	54	4·3	...	32	41
x Packham's Triumph (*selfing*).	,, ...	1927	493	...	6	1·22	...	...	...	...	...
		1928	1,504	...	28	1·86	...	...	...	...	...
		1929	4,877	...	60	1·23	...	...	...	...	...
		1930	416	185	8	4·32	...	...	...	46	17
		1932	343	263	0	0·00	...	...	...	40	0
Natural set ...	....	1927	2,360	...	95	4·02	...	...	...	...	...
		1928	2,072	...	108	5·21	...	...	...	...	...
		1929	4,116	...	163	3·96	...	...	...	...	27
		1930	3,740	...	185	4·95	...	...	...	436	42
		1931	968	...	24	2·48	...	...	...	133	18
		1932	2,513	...	130	5·17	...	...	...	285	46

The choice of a variety to act as a polleniser for Packham's Triumph depends on a number of considerations, the primary one being the ability to cross-pollinate this variety. The blossoming period should synchronise with that of Packham's Triumph to obtain maximum crossing in every season, or it should overlap the latter by about a week, preferably during the earlier part of Packham's blossoming period. Further, it should be a regular and profuse blossomer, capable of being reciprocally pollinated by Packham's Triumph. The final consideration is the value of the variety according to its commercial qualities and suitability to district and locality.

Blossoming records taken at Bathurst show that, of the varieties tested, Winter Cole, Clapp's Favourite and Doyenne du Comice do not fulfil these requirements. They are too late in blossoming, in addition to which the last-named variety usually blossoms too sparsely to be classed as a dependable natural polleniser for Packham's Triumph. Williams, the variety most widely grown in New South Wales, was found to intercross freely with

Packham's, but usually commences to blossom somewhat later. The blossoming periods of these two varieties, however, do overlap sufficiently to allow of inter-pollination between most of their blossoms. The varieties whose blossoming periods best coincide with Packham's and from this viewpoint are more suitable than Williams, are Josephine de Malines, Baronne de Mello and Beurre Superfine, of which the first-named is much the best commercial variety.

When planting a new orchard it is wise to make provision for two or more inter-pollinating varieties. This precaution is necessary because climatic and seasonal variations may cause any pollinating variety to deviate from its normal behaviour, both as to the time and amount of blossom produced. Mr. H. Broadfoot* states the reasons as follows:—"If two varieties, Josephine de Malines and Packham's Triumph, are planted, the latter may develop and blossom before the former and consequently Packham's would be a few years without a polleniser. . . There are times when any one variety may fail to blossom, or only develop a few very weak blossom buds; in such a case, if only two varieties have been planted, cross-pollination is not possible and crop failure may result. This risk is lessened if three varieties are planted."

These facts have been well illustrated at Bathurst in recent seasons. In 1930 Josephine blossomed sparsely and commenced blossoming a little later than Packham's; a cold spell of about three days widened the gap between the maximum blossoming periods to such a degree as to make it quite useless as a polleniser that season. In 1931 four of the six Josephine trees in the orchard practically failed to blossom. Last season (1932), as in most seasons, their blossoming dates synchronised. Having regard to this factor, the choice of a variety, in addition to Josephine and Williams, will lie between Baronne de Mello, Beurre Superfine, Howell, Beurre d'Anjou, Beurre Clairgeau and Madame Henri Desportes, according to their commercial qualities. Of all these varieties, probably Howell and Beurre d'Anjou are to be preferred as commercial varieties, although both commence to blossom slightly before Packham's Triumph. Howell is a good early pear, and Beurre d'Anjou, although a shy cropper, is of high quality and in demand for export.

TABLE VI.—Reciprocal Cross-Pollination With Packham's Triumph.

Variety.	Years tried.	No. pollinated.	No. set.	Percentage set.
Williams x Packham's Triumph	1929, 1931, 1932.	814	147	18·06
Josephine x do	1929, 1930, 1931.	307	46	17·07
Baronne de Mello x Packham's Triumph	1930	141	6	4·26
Beurre d'Anjou x do ...	1930	260	17	6·54
Winter Cole x do ...	1932	188	42	22·33
Beurre Superfine x do ...	1932	138	17	12·3

* 1928.—*Agricultural Gazette*, N.S.W.: 39; 538.

It remains to show that Packham's Triumph is reciprocally a satisfactory polleniser for the varieties recommended. In the 1930 season Baronne de Mello proved to be satisfactorily pollinated by Packham's, though not as well as Williams and Josephine were. Josephine and Williams, over three years' test, and Beurre d'Anjou, Winter Cole and Beurre Superfine in one year's test, were suitably pollenised by Packham's Triumph. The other varieties used on Packham's Triumph have not yet been tested reciprocally.

In addition to providing suitable pollinating varieties, a further essential is the presence of plenty of insect visitors (chiefly honey bees) for pollen transference. The fact that occasional years are characterised by adverse blossoming weather, necessitates that special emphasis be given to the necessity for providing plenty of bees. One strong hive of bees per acre of orchard is by no means too many.

A pamphlet entitled "Cross Pollination of Fruit Trees," which deals with further practical aspects of cross-pollination, is available on application to the Under Secretary, Department of Agriculture, Box 36A, Sydney.

Summary.

1. Packham's Triumph pear is a local variety, which now ranks second in commercial importance to Williams in this State.

2. Complaints have been received from orchardists in the tableland districts concerning the general unsatisfactory cropping of this variety. The same uncertain cropping has also been experienced at Bathurst Experiment Farm.

3. These experiences led to investigations being conducted at Bathurst Experiment Farm from 1927 to 1932 (inclusive), to determine to what extent this variety is self-fruitful or self-sterile, and what varieties would pollenise it best.

4. Self-pollination tests by various methods show that Packham's Triumph is largely self-unfruitful, only 1.44 per cent. set being obtained from over 7,000 blossoms pollinated.

5. On examination the majority of the few fruits derived from self-pollination proved to be seedless or of low seed content. This shows that true self-fertility, as indicated by seed content, is of a low order and that other factors considerably influence the self-fruitfulness of this variety.

6. The low seed content of self-pollinated fruits caused them to be smaller and more unshapely and more liable to drop, than the fruits resulting from cross-pollination.

7. The average fruit set from cross-pollination was twelve times that from self-pollination, *viz.*, 17.28 per cent. and 1.44 per cent respectively.

8. The crossed fruits have a much higher seed content, and generally much improved size, shape and quality, compared with fruits derived from self-pollination.

9. These results show conclusively that cross-pollination greatly improves the quantity and quality of the fruit set, and they demonstrate the necessity of providing for efficient pollination in the commercial orchard.

10. On all trees used for cross-pollination studies, artificial crossing increased the set four times over the natural set, and some reasons for this significant increase are given.

11. Considerable differences were found in the percentages of natural setting on trees of the same variety in the same year. The average natural setting varies from year to year.

12. A comparison of the natural sets on the excluded limbs of a caged tree (bearing little fruit inside the cage) with that of uncaged open trees indicates the relation of the setting to the internal nutrition of the fruit and of the vigour of the tree.

13. Williams proved an efficient polleniser for Packham's, except that it commenced blossoming a little later.

14. Of the varieties tested, Josephine de Malines, Baronne de Mello, and Beurre Superfine usually blossom at the same time as Packham's, and from this viewpoint they are more suitable for interplanting than Williams. These varieties can be confidently recommended as the most suitable pollenisers for Packham's Triumph. Josephine is the first choice of these, as it is the best commercial variety.

15. Howell and Beurre d'Anjou, which are good commercial varieties, are satisfactory pollenisers during the beginning of the blossoming period of Packham's Triumph.

16. To ensure satisfactory pollination in the commercial orchard, at least two suitable pollinating varieties should be interplanted, at effective distances, or else top-working with these varieties should be resorted to.

17. The provision of at least one hive of bees per acre is necessary to ensure maximum transference of pollen.

From articles appearing in the press from time to time lauding the work of cactoblastis, a number of landholders were forming the impression that the end of the prickly pear pest was in sight. In some districts, this optimism was no doubt justified, but in others it was not. According to the latest report of the Prickly Pear Destruction Commission this wrong impression caused considerable trouble in localities where cactoblastis was not a success, as landholders naturally wished to leave the work to such an unexpensive method. By doing so, a break in the continuity of destruction eventuates, involving a much greater expenditure than would otherwise have been necessary.

British statistics indicate that the United States furnished 39 per cent. of British apple imports in 1932, Australia 20 per cent., Canada 20 per cent., and New Zealand 7 per cent. Receipts from the United States were 11 per cent. less than during the previous year, and those from Canada 9 per cent. less, while shipments from Australia increased 63 per cent. and those from New Zealand 40 per cent.

Strawberry Culture.

[Continued from page 450.]

R. B. THOMAS, Orchard Inspector.

The Best Varieties to Grow.

The varieties of strawberries are continually increasing, but like other fruits it is found when the time comes to select the variety to plant commercially there are only two or three worth considering.

The strawberry mostly in demand is one that is firm and large, of a good crimson red colour, and one that holds well after being picked. Flavour, productiveness, susceptibility to disease and time of ripening must also be considered. It has also to be remembered that there is a heavy loss from sunscald of varieties that do not provide sufficient foliage to shade the fruit. Another factor worthy of notice is the nature of the blossoms (see illustrations), whether perfect (staminate) or imperfect (pistillate).

Perfect (Staminate) Blossoms.

Imperfect (Pistillate) Blossoms.

Creswell's Seedling came into prominence about 1895 (thirty-eight years ago), and at the present time is the chief variety grown in the Ryde district, an old strawberry-growing district and one in which growers have been continually testing out both imported and Australian-raised varieties with a view to improving their returns. The chief varieties grown in the Sydney suburban area are Creswell's Seedling and Fendelcino. Fendelcino's blossoms are imperfect (pistillate), and it is therefore necessary to plant a perfect early-blossoming variety in conjunction with Fendelcino. The varieties found most suitable for pollinating Fendelcino are Port Macquarie and Rhodes' Special, which are planted for pollinating purposes at the rate of one line of either of these varieties to three of Fendelcino.

It is important also that the berries be dry when picked, for if picked when moist, moulds are liable to start very quickly.

Treatment after Harvesting.

The plants having finished fruiting for the season, it must now be decided whether the bed is to be grown on for another year or discarded. Strawberry beds of late years are rarely grown on for more than two years, as diseases and pests usually take heavy toll of the plants after the second year.

If the plants are to be grown on they should not be allowed to dry out as is usually the case. The runners should be removed, except in cases where plants are required for future planting, etc. When plants are required, the soil between the rows should be loosened up with a fork, lightly fertilised, and well watered to stimulate the development of well-rooted plants. If the plants have been mulched with tan bark, weeds will not be very troublesome during the winter.

During July and August a start should be made to prepare the plants for the succeeding season. All the old dried-up leaves should be removed and if the crowns are too packed they should be thinned out. Any weed growth that cannot be turned under with the fork should be removed from the bed. A dressing of blood and bone at the rate of 11 cwt. to the acre, or an adequate dressing of fowlyard or stable manure could be used. It should be spread evenly between the rows and then dug in with a fork or hoe. The bed should then be kept in good order until mulched in preparation for the coming crop.

Estimated Costs.

The following is an estimate of the cost of establishing and harvesting one quarter of an acre of strawberries, planted on the level row system (20 inches between the rows and the plants 8 inches apart in the rows) and based on an assumed yield of 2,000 12-oz. punnets at 7s. per dozen, equivalent to 2 tons 13 cwt. per acre. Labour is charged up at the rate of 14s. per day.

Cost of Growing and Harvesting ¼-acre Strawberries.	£	s.	d.
Preparation of the land for planting	2	0	0
10,000 plants at 18s. per 1,000	9	0	0
*Two 160-lb. bags of blood and bone at 10s. 6d. per bag	1	1	0
Five days planting and trimming plants at 14s.	3	10	0
Three days per month (June, July and August), hoeing, etc.=9 days at 14s.	6	6	0
Four days allowed for mulching at 14s.	2	16	0
Four loads of tan bark for mulching at 15s.	3	0	0
2,000 punnets at £2 15s. per 1,000	5	10	0
Picking and packing costs, 1½d. per punnet for 2,000 punnets ..	12	10	0
Freight ½d. per punnet on 2,000 punnets	4	3	4
Three days allowed per month during harvesting for hoeing, watering, etc.=9 days at 14s.	6	6	0
†One bag of fertiliser for top-dressing	0	10	6
‡Cost of water, allowing 86,000 gallons at 1s. 2d. per 1,000	5	0	4
Selling charge, 7½ per cent. on £58 6s. 8d.	4	4	10
Total cost	£65	18	0

* 2 bags of blood and bone (320 lb., or just over ½ oz. per plant).

† 1 bag of superphosphate and sulphate of ammonia (186 lb. which would allow just over $\frac{3}{10}$ oz. per plant).

‡ 86,000 gallons of water would allow just over $8\frac{7}{10}$ gallons per plant.

The probable cost of producing and disposing of the 2,000 punnets of fruit is £65 18s. as against the estimated return of £58 6s. 8d. for the crop at 7s. per dozen punnets. It will, therefore, be seen that there has been an actual loss of £7 11s. 4d. incurred. If the plants are grown on for more than one year, possibly the same total expense would be incurred, excepting for plants, the cost of which would be spread over the number of years the bed lasted. The ¼-acre of plants would produce approximately 100,000 plants if they were all allowed to run. Say 10,000 plants were sold at 18s. per 1,000 and 10,000 plants retained for the growers own use, this means that an additional £18 for plants would be added to the gross returns.

As strawberries are usually grown as a sideline, the grower doing all the work himself, even producing his own plants and often carting and selling the berries in conjunction with other crops, about the only actual out-of-pocket expenses incurred are those given hereunder:—

	£	s.	d.
Fertiliser	1	11	6
2,000 punnets at 55s. per 1,000	5	10	0
Four loads of tan bark at 5s. per load at the tanneries	1	0	0
Cost of water	5	0	4
	£13	1	10

With a gross return of £58 6s. 8d., and taking into account only out-of-pocket expenses, this would leave a profit of £45 4s. 10d. from a quarter-acre plot, which really represents wages to the grower for the time he spent producing and marketing the crop.

(Concluded.)

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1932 budding season, trees from which should be available for planting during the 1933 planting season :—

Nurseryman.	Oranges.		Eureka. Lemon.	Marsh. Grape-fruit.	Total.
	Washington Navel.	Valencia.			
L. P. Rosen and Son, Carlingford...	4,000	4,000	1,000	1,000	10,000
T. Adamson, Ermington	1,500	1,500	500	250	3,750
A. T. Eyles, Rydalmere	2,000	1,000	...	...	3,000
H. J. Ferguson, Wyong	...	200	...	...	200

—C. G. SAVAGE, Director of Fruit Culture.

Orchard Notes.

JULY.

C. G. SAVAGE and W. Le GAY BRERETON.

Pruning Deciduous Trees.

THE most important work during this month is pruning, which must be pushed on as fast as possible so that it will be completed and the ground well ploughed while it is still moist. The grower must make himself familiar with the fruiting habits of each type of fruit grown (and even each variety in some cases), and for this purpose the handbook issued by the Department (price 3s. 4d. posted) will be found very useful.

Burn all prunings as soon as possible. The most expeditious way to accomplish this is by means of an old tank mounted on wheels.

While pruning and working around the trees, always keep a sharp look-out for any diseases and mark any trees so affected. When it is intended to do any grafting work in the spring, scions with well-developed buds should be selected this month from picked trees which have borne good crops of good quality fruit. These should be heeled into the ground in a cool, damp (not wet) position.

Disease and Pest Control.

Leaf Curl.—With the exception of some of the very early blossoming varieties of peaches, such as Bell's November (which should be sprayed earlier), it is a good time now to apply winter-strength lime-sulphur, or 6-4-40 Bordeaux mixture. The application should be thoroughly done, care being taken that the spray reaches out to the ends of the finest laterals. It is quite easy to spend too much time and spray on a tree and yet miss the essential parts.

Black Peach Aphis.—If black peach aphis are showing on the trees—which sometimes happens in the winter months, and which is a sign that the outbreak on those trees will be severe in the spring—tobacco wash or nicotine sulphate should be added to the leaf curl spray. The right proportion of each ingredient in such a combined spray must be carefully maintained. If preferred, the trees can receive an additional application of miscible spray oil when the buds are well swollen in the spring instead of the combined spray in the winter.

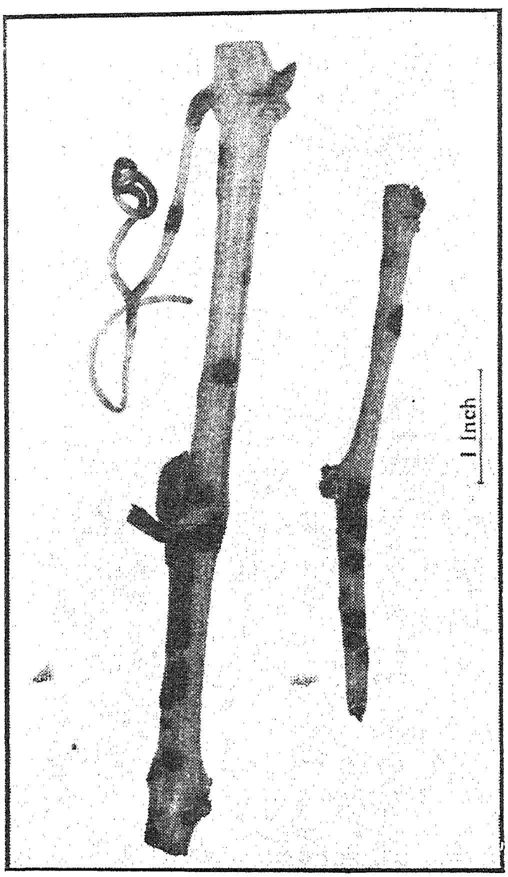
San Jose Scale.—It is during pruning that the presence of this pest on deciduous trees is often detected, and such trees should be marked for special treatment, as described last month.

Powdery Mildew.—The removal, where possible, during the winter pruning, of all apple twigs affected with powdery mildew will greatly help in

keeping this fungus in check. This step should be followed by spraying with lime-sulphur or dritomic, atomised or colloidal sulphur at the spur-burst and later stages.

Black Spot of Grape Vines.

This disease of the shoots, canes, leaves, and bunches of the grape vine is caused by a fungus which is propagated mainly by spores which are formed at the end of fungus threads in the affected tissues, and which are produced in large numbers, earlier and at lower temperatures than those of downy mildew.



Black Spot Cankers on Canes and Tendrils.

Both winter and summer treatment are necessary to ensure effective control, and growers should carry out the former while the vines are dormant.

The winter treatment recommended is as follows:—

1. *Burn Prunings.*—After pruning, all cuttings should be collected and burnt.

2. *Remove and Burn Loose Bark.*—If time and labour permit, the vines may have the loose old bark removed and burnt. To leave it on the ground is worse than useless.

3. *Swabbing or Spraying.*—While dormant, the vine should be swabbed or sprayed once or twice with one of the following solutions:—

(*a*) Sulphate of iron-sulphuric acid solution (5 lb. sulphate of iron, ½ pint sulphuric acid, 1 gallon water); or

(*b*) Sulphuric acid (1 gallon to 10 gallons water).

Swabbing undoubtedly reduces the total amount of infective material upon the vines, and thus provides against an early attack of the disease. It delays the bursting of the buds a week or ten days, and is advantageous, on that account, in districts that are subject to late frosts.

A leaflet which discusses this disease in detail is available from the Department free of charge.

Destroy Overwintering Codling Grubs.

The larvae from the third or last autumn brood of codling moth, the majority of the second brood, and even a few of the first brood, spin their cocoons on the trunk and limbs, and remain as larvae throughout the winter months. They are usually to be found in the shelter of cracks or crevices, under loose bark, or against any roughnesses. Cocoons are also to be found about the packing sheds, in cracks in the floors and walls, and in the corners of packing cases, etc.

Upon the number of grubs which succeed in overwintering depends the number and extent of the spring brood of moths the following season. Half the number of these grubs will develop into female moths, each capable of laying many dozens of eggs in the early summer. Growers are therefore urged to take particular care to destroy as many as possible of these grubs overwintering in cocoons, so as to reduce to the minimum the outbreak of next season.

In the examination of crevices and loose bark for codling moth larvae, a piece of wire will be of assistance. Though many grubs will probably be found on the trunk and crown (where the main limbs spring from), it is best when searching to follow right up along the main scaffolding branches of the tree. A putty made by mixing whiting with boiled linseed oil will be found to be effective in blocking up small cavities, and will very materially add to the value of bandages by reducing the number of cocooning places about the trunks and main limbs. Bandages should be removed from the trees by the end of July and not replaced till mid-November.

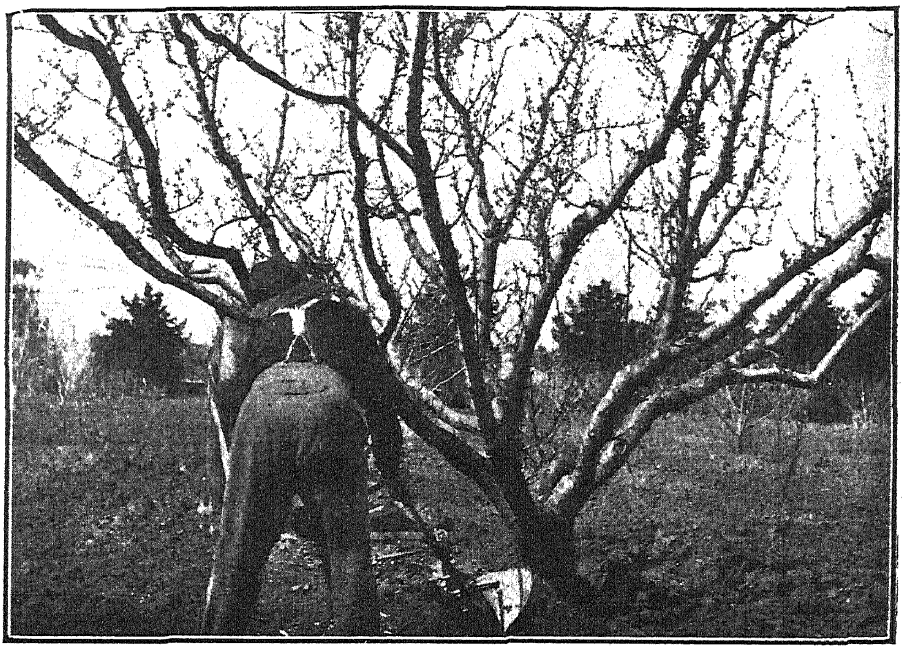
Where second-hand cases are used, dipping in boiling water for three minutes is an important precaution against re-infestation of the orchard. Where possible, packing houses should be made moth-tight, when the moths may be readily destroyed at the windows.

The Winter Ploughing.

If the land has been ploughed in late summer or autumn, following the trampling received during the picking season, it is often possible to allow the second ploughing to be deferred until nearly spring, but should the land have become badly compacted again or covered with a heavy growth of weeds, the second ploughing should be completed by the end of July. Where a green manure crop has been sown it should be ploughed under before the end of this month. If for any reason the autumn ploughing was omitted the land should be ploughed as early as possible.

When two ploughings are carried out during the dormant season, the second ploughing generally leaves the soil in a suitable condition to absorb readily any rain or artificially applied water, and it can then often be left undisturbed for some time during the spring.

Broadly speaking, mouldboard ploughs are more suitable for orchard work than disc ploughs, but conditions may occur in some orchards which will make the use of a disc plough preferable. The reversible plough, which can be adjusted to throw all the sod one way instead of in lands, is very little used in orchards, but such a plough has been found very serviceable on a steep slope on the Kurrajong, where a sod turned down the hill can never be thrown so far back up the hill again, and the soil is being continually worked down the hill. By using a reversible plough the grower can always throw the furrow up the hill, thus counteracting the tendency of the soil to creep downwards.



A single-furrow swivel-handled plough in use at New England Experiment Farm.

Harvesting Citrus Fruit.

The greatest care should be taken when picking citrus fruit, as the slightest bruising, although not apparent at the time, causes decay in transit. The fruit should be carefully graded and packed to ensure high prices.

Many persons are under the impression that because an orange is protected by a somewhat tough and more or less elastic skin, rough usage is not injurious, and so far as they can see this is so. The fruit is picked, packed, and forwarded with little loss of time, but frequently during transit or whilst awaiting sale the result of rough treatment becomes apparent. Through skin scratches or punctures, rot organisms, such as blue mould, enter and begin their destructive work, and in the aggregate take heavy toll of the crop. Growers should see that such loss is minimised or prevented by careful handling.

Quickness in handling does not necessarily accompany or result in carelessness and loss. In packing, the fruit should be carefully sized and graded for quality. The cases should be lined with paper, as in many instances the interior surface of the case is rough, and is likely to cause skin abrasions to unprotected fruit with consequent entrance of rot organisms.

All waste or fallen fruit should be burnt or boiled at short intervals. This is of great importance, as it assists in minimising the depredation of certain insect pests and fungous diseases. This will be universally effective only when universally carried out.

Squirter Disease in Bananas.

Are Dirty Packing Sheds Responsible ?

Writing in our last issue, Mr. H. W. Eastwood warned banana growers that they were courting trouble by leaving rotten and discarded fruit lying about the packing sheds. The filthy condition of some packing sheds, Mr. Eastwood said, might be responsible for disease and wastage in cased fruit after it had left the packing shed for market. Growers were therefore advised to sweep all rubbish from the floors regularly after each packing and remove it and all rejected fruit far away from the shed—perhaps it would be best to bury it.

Strong backing for this advice is given by a recent pronouncement that the causal organism of squirter disease in bananas had been discovered by Dr. Ethel McLennan, of the Department of Botany, Melbourne University, and that it was suspected that the trouble was likely to be traceable to unhygienic conditions in packing sheds.

The discovery that the fungus *Nigrospora musae* is the cause of squirter should bring the problem of control much nearer solution. Up till the announcement of this discovery, chilling (or at least sudden and marked changes in temperature), either on the plantation or during transit, was suspected as being the cause of squirter.

Export of Citrus Fruit to Canada.

Mr. Savage's Report Now Available.

The need for developing export markets is becoming each year more imperative in the citrus industry, and for such development it is necessary to have an exact knowledge of the demands of the particular market to be served. These demands are the expression of a definite preference on the part of the consumer, and they must be closely conformed to if export is to be attended by success.

Of overseas outlets for Australian citrus fruits Canada promises to be of considerable significance, and more especially the so far largely unexploited eastern side of the Dominion, if suitable transport could be arranged. Stimulated by the advantages conferred by the recently established

Canadian-Australian trade agreement, this five-year-old market (the first commercial shipment was made in 1928-29) already shows a healthy growth, but for its maximum development there has been need for information on a number of important points. It was for the purpose of gaining such information and generally putting the trade on a satisfactory footing that, as the result of growers' representations and through the co-operation of the Fruitgrowers' Federation and the Commonwealth Bank, arrangements were made for a departmental officer to proceed to Vancouver by the R.M.S. *Niagara,* the vessel carrying the second shipment of the 1932 season (comprising Washington Navel oranges and lemons) last July. In a just issued report Mr. C. G. Savage, Director of Fruit Culture, presents not only his findings with respect to the marketing of New South Wales citrus and other fruit in Canada, but valuable data also regarding fruit-growing industries and methods in that country and U.S.A.

The report has been divided into two sections. In the first the writer briefly traverses the history of commercial export of our citrus fruit to Canada, details the condition on arrival of the consignment he accompanied, summaries the trade comment in this and other connections, describes at length the methods of Californian growers (a very informative chapter), and makes certain recommendations based on the data acquired. The fact is emphasised that the eastern Canadian market is the more extensive. Among the points stressed is, first and foremost, the need for uniformity in quality and packing, involving central packing houses; the raising of the maturity standard for Valencia oranges (the shipping of sour fruit having caused an unfavourable impression); the raising of the juice standard (Canadians consuming most of the oranges as juice); the waxing of oranges to reduce shrivelling to a minimum; and the curing of lemons to increase the juice content and reduce waste. To ensure that the fruit is marketed in the best possible manner, states the report, the creation of an Australian citrus export board should be seriously considered. This board should be composed of growers and shippers, and no citrus fruit should be allowed to be shipped except through the board.

The second section of the report deals with deciduous fruit and other investigations. It records the results of inquiries made both at Vancouver and Toronto into the dried fruit trade from the point of view of Australian exports, also regarding Australian canned fruit. Among other subjects dealt with are the advisability of amending the Australian apple grading regulations to bring them into line with those of our competitors, by-products of fruit, preservation of fruit by the frozen pack method, nut production, the possibilities of local date culture, cold stores and storage, etc.

While the contents of the report are of particular moment to citrus growers, it contains, it will be seen, much of interest to other orchardists. A limited number of copies are available for general distribution. Applications should be addressed to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.—EDITOR.

Passion Fruit Juice a Luxury in England.

In the domain of flavours, so well has the ground been explored, real novelty is almost unknown, says *Food Manufacture* (London). There are, however, quite a number of agreeable flavours, well known and appreciated in other parts of the world, which are relatively little known in this country.

Passion fruit supplies a case in point. The flavour of this fruit, though recalling in a manner that of black currants, is more acid than this, and has a character which is quite individualistic. Some little time ago reference was made to an artificial passion fruit flavouring essence which had been placed on the market. At the British Industries Fair we were interested to note one stall entirely devoted to a display of real passion fruit juice and passion fruit cordial.

The juice itself forms an excellent cocktail, which may be made more interesting by the addition of gin. Vermouth may also be added at discretion. As a flavouring for fruit salads the juice can also be warmly recommended. It would appear that the passion fruit flavour, so much and so justly appreciated in Australia, is no longer to be neglected by housewives and by foodstuff and beverage manufacturers in this country.

Fruit Wines from Bananas and Pineapples.

According to an overseas news item banana wine and pineapple wine were given some prominence at the British Industries Fair. Banana wine, we understand, has been on the English market for about five years now and is very popular. Pineapple wine is a more recent innovation, but it also has taken on very well.

The banana wine is made from fully ripe bananas, peeled and crushed by machinery. The resultant paste is liquefied, sterilised and then fermented. The pineapple wine is made in a somewhat similar manner, the juice being obtained by crushing the fruit, after which it is sterilised and fermented.

What Returns Can be Expected from Peanuts ?

Yields from peanuts vary considerably, but from 700 to 1,000 lb. may be anticipated from an acre under suitable soil, climatic and cultural conditions. The present trade price in Sydney for bulk supplies of unshelled nuts of good quality of the Spanish variety (for processing), free from extraneous matter and in good order and condition, is from 3d. to 3½d. per lb., and for Virginia (for roasting) of the same standard about 4½d. per lb. Against this average return of, say, £12 per acre has to be reckoned the cost of production, plus that of digging, stacking, curing and removing the nuts from the vines—the last-mentioned a very substantial item unless done co-operatively by means of the necessary special machinery—and providing the clean, graded sample required by the trade.

Disease in Stock.

PREVENTION IS BETTER THAN CURE.

A. L. ROSE, B.V.Sc., District Veterinary Officer (South).*

THAT old slogan, "Prevention is Better than Cure" has a special application to the pastoral industry of Australia, because holdings are comparatively large and the stock are both numerous and scattered, these factors increasing the difficulties of controlling diseases that have become manifest in the stock.

In his address Mr. Rose indicated the many and varied practices which are available for the prevention of disease in stock. Examples of each method of control were given, although no attempt was made to refer in detail to any of the disease conditions. Some of the practices referred to are capable of execution by the stockowner himself, while others depend upon expert advice and laboratory examination, and in connection with these latter readers are referred to their district inspector of stock, who will either give the desired advice or assistance himself or else draw upon other resources of the Department for them.

Control by Destruction.

THE "slaughter-out" policy is a system of control which is only rarely adopted in Australia. This method of control is officially adopted with the object of quickly eradicating a highly infectious disease which may have been recently introduced into the country. All animals in contact with the diseased animals are slaughtered and their carcases destroyed. In this way the disease is wiped out and the stock in the remainder of the country are protected against the ravages of the disease. Rinderpest, a serious cattle disease, was introduced into Western Australia in 1923 and was eradicated in one month at the cost of £50,000 in expenses and compensation, and the cattle industry of Australia was thereby saved a loss which could only be calculated in millions of pounds. In 1928 the outbreak of swine fever in New South Wales was similarly dealt with, and at the present moment this same line of attack is being directed against Newcastle disease of poultry in Victoria.

Another method of preventing the spread of disease by destruction depends upon the destruction of the manifest or obviously affected animals only. For example, an animal which has the chronic cough of tuberculosis is continually spreading the germs about for other animals to pick up. The further spread of this disease is therefore largely prevented by the destruction of animals which are obviously affected. Actinomycosis is the proper name for the true "lumpy-jaw," a disease which principally affects the bones of the jaw. The pus from the diseased area breaks out and discharges,

* An address by Mr. Rose at the Seventh Annual Conference of the South-western District of the Agricultural Bureau, held at Young.

thus permitting the germs to be spread about for other animals to pick up. Here again destruction is the only course of action to prevent the spread of the disease. In dealing with these cases, however, it is very necessary to be able to discriminate between dangerous lumps and lumps which are not of a serious type. An essential part of the control of "pleuro" in cattle is the early destruction of the affected animals; in some countries the "slaughter-out" policy is adopted against this disease, but in Australia the disease is too firmly established for this method to be economically possible.

Control by Vaccination.

The vaccination of animals is a procedure adopted to confer protection or immunity to a certain disease. The "vaccine" used is usually prepared in a laboratory, and it is made from the microbes which cause that particular disease in the animals. The vaccination of stock against anthrax is probably the best example we have of this method of disease prevention in Australia. As the germs of anthrax may live in the soil for very many years, it is advisable for people in anthrax country to vaccinate each year. Should any cases of anthrax occur, the balance of the stock can be immediately protected from disease by vaccination. Black-leg is a serious disease of young cattle on the coast, and of sheep on some western properties, but losses from this disease may be prevented by the use of an appropriate vaccine. Black disease is a serious disease of sheep in the better-watered districts of the State. This disease has accounted for the loss of millions of sheep in the past, but quite recently a vaccine has been evolved, the use of which we hope, will largely assist in preventing a continuance of previous losses. "Pleuro" of cattle is prevented from spreading to other animals by inoculating them with "virus" taken from a diseased beast, and finally we believe in New South Wales that the judicious use of a vaccine will materially reduce the very great annual loss caused to the dairy industry by the disease of the udder of cattle known as mammitis.

Medicinal Treatment.

The medicinal treatment of groups or flocks of animals is practically confined to the administration of worm medicines. Graziers on "fluke" country know the value of periodically treating their sheep to rid them of this serious parasite of the liver. The widespread adoption of this treatment since 1926 has been the means of preventing an enormous loss which previously occurred annually. With worm parasites of the stomach, intestines and lungs the position is unhappily not nearly so satisfactory, but even these parasites in their worst form are capable of being brought under control by an organised system of medicinal treatment. These worm parasites seem to have spread at such a rate during recent years that the symptoms they cause in sheep pass unrecognised by owners who are unaccustomed to them, with the inevitable consequence that heavy losses result. Worms are undoubtedly the cause of more loss than any other one factor in the sheep industry to-day, and it is certain that much of this loss may be prevented by appropriate means.

Nutritional Factors.

The nutritional aspect of disease prevention offers more scope for successful application by the stockowner than is generally realised. A tremendous amount of preventable loss occurs in all classes of stock as a direct result of incomplete nutrition. No feed or pasture can be regarded as completely satisfactory to the animal unless it contains all the food elements necessary to ensure the even growth of the young, the maintenance of body functions of adults and the satisfactory production of wool, meat, milk, eggs, etc., as the case may be. Pasture conditions vary in Australia within very wide limits, and with these seasonal variations run considerable variations in the nutritional value of the feed, with the result that stock are frequently under-nourished for a period of the year even though the feed appears to the stockowner to be satisfactory.

Stock are necessarily forced to eat the feed available whether it is ideal for them or not. Much, however, can be done by judicious stocking and the use of mineral food supplements to offset the deficiencies which may exist in the feed. It appears to be an undeniable fact that much of our grazing land is slowly and steadily depreciating in feed value. This loss in value is directly due to constant stocking over a period of years. A wealth of nutritional matter has been withdrawn from the soil by plants and has been converted into meat, wool and butter. This process of extraction cannot continue indefinitely without its effects becoming apparent in the incomplete growth and production of the stock. In the past rabbits must have contributed largely to soil and pasture deterioration, and if they overrun our country again this deterioration may reach a degree at which the land will be incapable of supporting stock.

The point of interest in connection with land and pasture deterioration is that while the stock suffer in growth and production, they also suffer by a greatly increased susceptibility to disease. For example, the increased prevalence of stomach and intestinal worms in sheep is undoubtedly due largely to a decreased resistance of the sheep as a result of the failure of the land to nourish them completely. Some experimental evidence of this theory is already available in which it is shown that minerally complete feeds may render the animals largely immune to the ravages of these parasites. The provision of a correct mineral lick should therefore be an essential factor in an organised system of worm control.

Probably the most obvious "indicator" of mineral deficiency is the dairy cow. The strain on the mineral resources of the milking cow are so severe that she draws on the minerals in her own bones in order to provide these essentials for the calf she is carrying and for the milk that is relentlessly extracted from her. Small wonder is it that the dairy cow is the subject of many disease conditions. She indicates her urgent needs most plainly by chewing bones, but this broad hint is usually ignored by the farmer, and then under this strain of production, the cow falls off in appearance and production and the weakness of her bones may even cause her to go stiff in the gait. In addition, the bones that she chews may contain a germ

poison capable of causing her death within a week from the impaction of the stomachs caused by botulism. There is evidence that this depleted mineral condition may be the cause of "milk fever," and may even interfere seriously with the breeding efficiency of the animal.

Whereas these evils are fairly obvious in cattle, there is no doubt that the same deficiencies operate to the detriment of sheep and other animals. Lime and phosphorous appear to be the minerals which are most universally deficient and both these minerals may be supplied to stock in the form of bonemeal in conjunction with coarse salt. Another very valuable source of these minerals is "di-calcic phosphate" which is now obtainable in this country.

During the winter of 1931 we saw a totally different type of deficiency. Everywhere feed was prolific, but it was rank and lacked essential nourishing factors, and this deficiency was quickly reflected in the general health and condition of ewes and lambs. It is considered that sheep during that season would have benefited very considerably had they been allowed a little grain or other concentrated food, or had the paddocks been kept well trimmed down by cattle. Earlier than 1931 we had what was practically a drought, and during this period many thousands of ewes forward in lambs were lost from "lamb sickness" or toxaemia of pregnancy. The close study of this condition indicates that it is yet another of the evils that are attributable to faulty nutrition.

Management Based on Known Facts.

The knowledge which scientific discovery has given us may be applied in many ways on the station and farm to prevent disease or the spread of diseases in stock. For example we know of a number of serious diseases which may occur if shearing operations are not carried out with due regard to proper sanitary precautions. Old skins are strewn over the board between shearings, and these may leave germs which find refuge in cracks in the boards which are packed with the accumulated dirt of years, while the counting out pens are inches deep in manure, dead wool and portions of horns and hooves. The open and bleeding wounds of sheep mutilated at shearing are brought in contact with this germ-laden filth, and if harmful germs happen to be represented in the debris, then a percentage of sheep will be lost from tetanus or gas gangrene (blood-poisoning), to say nothing of the very high percentage of sheep which will contract "cheesy gland" (caseous lymphadenitis) in this way. Dirty knives and yards may cause a like loss in lambs, subsequent to marking. All of these losses may be prevented absolutely by careful attention to cleanliness round the shearing shed and marking yards.

The liver fluke of sheep and cattle is a parasite which can only continue to propagate by passing part of its life in the sheep's liver and part in the fresh water snail. If the snails be killed out by treating the water-courses with bluestone then the fluke must die out. Black disease of sheep depends upon the liver fluke so that the treatment just referred to is a method of

dealing with these two serious conditions at the same time. The hydatid that is so commonly seen in the livers and lungs of sheep and cattle is the same one that affects the human being. Like the liver fluke, it must also pass through another animal to complete its life cycle, but in the case of the hydatid, the dog is the other animal necessary, and yet it appears to be a little known fact that the occurrence of hydatids in the human being, in sheep and cattle, can be absolutely prevented by the simple procedure of refraining from throwing the raw offal from sheep and cattle to the circle of dogs usually seen waiting for it.

A good example of disease prevention is the method of controlling "tick fever" of poultry. Every summer innumerable fowls are lost in towns and on properties from this cause. The disease is caused by a blood parasite which is transmitted to the birds by the bite of the fowl tick. The tick is concealed in cracks, etc., in the timber or the bark of trees, especially pepper trees, and comes out at night to feed on the birds on their perches, and in this way a few ticks can kill half the fowls in the yard. All this loss can be prevented definitely by adopting the recognised methods of having the fowl perches, etc., tick-proof. While on the subject of ticks, it might be stated that the control and eradication of the cattle tick and also "redwater," the disease which it transmits, can be effected by dipping the cattle in accordance with due regard to the life-history of the parasite, but this practice at present applies only to the north-eastern coastal portions of the State. The dipping of sheep for the "tick" or ked and for lice is a practice which demands universal attention throughout the State in order to prevent the spread of these parasites, and thus save the wool from unnecessary deterioration and the sheep from loss of condition.

The subject of harmful and poisonous plants is in itself a very large one, and the stockowner or drover can hardly afford to be without some knowledge of plants which are poisonous or which assume poisonous properties under certain sets of conditions. Thus from time to time we hear of heavy losses in sheep or cattle as a result of eating such plants as the variegated or cabbage thistle, blue couch grass, the milk weed (*Euphorbia drummondii*), sorghum and sudan grass types, and the loppings of sugar gum trees. All of the foregoing plants may be poisonous under certain seasonal conditions, and provided the stock which eat them are unaccustomed to them and consume a considerable quantity when hungry. These are but a few of a large list of plants which may be the cause of mortality from time to time.

The destruction of carcases in the paddocks is an item of importance in disease control. The most desirable method is by burning, but when fire risk prevents this, burial might be adopted, and if the ground is too hard for this a lot of good will be done if the carcase is freely opened, the limbs detached, and the internal organs cut and spread about. The heat of the sun will then dry up the flesh and animals and birds will soon dispose of the offal. This method is hardly desirable in the case of germ diseases, but it is an effective way of depriving blowflies of breeding grounds. An

outstanding exception to this latter method of disposal is the animal suspected of dying of anthrax. On no account should such a carcase be opened.

It should be of special interest to dairymen that many diseases are capable of being introduced into their herds as a result of continual and indiscriminate purchasing. Cattle may carry the microbes of serious diseases in their bodies without betraying the fact in any way. Among such diseases are tuberculosis, pleuro-pneumonia ("pleuro"), contagious abortion, and mammitis, and the risk of introducing these diseases is greatly increased to the farmer who continues to buy and sell rather than build up his own herd by breeding. In the same way the sheep men may purchase sheep which are lightly infested with lice or tick, and which in the course of a very few months become heavily infested.

Control by Technical Tests.

Tuberculosis and contagious abortion are both diseases of cattle which may not be capable of detection at an ordinary inspection or examination, but for these two diseases there are technical tests which can be applied with a view to determining definitely whether animals are infected or not. Both tests are used in systems aimed at eradicating these diseases from individual herds in New South Wales.

Control by Quarantine.

By quarantine is meant the isolation of an animal or group of animals suspected of being diseased. Such isolation prevents the spread of disease while a method of eradication is being adopted. A number of diseases are subject to official control by quarantine in this State, and this action should not be resented by owners, as without it the flocks and herds of other owners would be endangered. In a private way stockowners might save themselves much time and labour if they kept all purchased stock isolated from other stock on their property for a period; then if any trouble develops their activities will be confined to the purchased lot only.

Finally it might be stated that Australia is remarkably free from many of the serious diseases and plagues of other countries. This freedom is enjoyed by virtue of the rigid quarantine laws of the Commonwealth which serve to protect us from such diseases, examples of which are foot-and-mouth disease, rinderpest, rabies, glanders, etc., to mention only a few.

Great Britain's Cheese Imports.

During January and February of this year imports of cheese to Great Britain amounted to 481,781 cwt., of which 444,425 cwt. were supplied by Empire countries, and 37,356 cwt. by foreign countries. It is interesting to note that Empire countries increased their supplies by 38,000 cwt. over the same period last year and foreign supplies decreased by over 33,000 cwt.

New Zealand supplies for the first two months of 1933 amounted to 416,524 cwt., and Australia's quota totalled 19,658 cwt.

Scours in Calves.

CALF DIARRHŒA AND CALF DYSENTERY.

W. L. HINDMARSH, B.V.Sc., M.R.C.V.S., D.V.H., Senior Veterinary Research Officer, Glenfield.

BY "scours" in calves the farmer usually means illness of which diarrhoea is the most obvious symptom. According to the colour and character of the dung passed out, the stockowner differentiates what are to him the types of disease present, and hence the terms "white scour," "blood scour," "red scour," "black scour," "green scour," and so on, are commonly heard. The occurrence of scouring, however, is only an indication that the digestive system is not in a healthy condition, that the stomach and bowels are affected with inflammatory changes and hence are unable to deal with the food that has been eaten. These changes are due to the action of an irritant, which in some cases is a microbe, in other cases a parasite, and in others again may be some foreign material that has been swallowed with food and water, the scouring which occurs being the attempt by the animal to get rid of the irritant by washing it out. It will be seen then that in discussing "scours" of calves we will deal with a number of conditions, in which diarrhoea is a prominent symptom, but which are due to varied causes.

The different forms of scours may be divided as follows:—

1. Scours due to microbes in the bowel.
2. Scours due to parasites in the bowel.
3. Scours due to eating some irritant material.

Scours Caused by Bacteria ("White Scours" and "Blood Scours").

Under this heading fall most of the cases of diarrhoea of calves which are known to the farmer as "white scour," "red scour," or "blood scour." Although, as a general rule, a broad line of demarcation can be drawn between white scour and blood scour, in some instances the conditions may appear to merge into one another. White scour usually is found to affect calves up to ten days of age, whilst blood scour generally attacks animals over fourteen days old. The term blood scour is used to indicate those cases in which blood is present in the excrement, which is usually dark in colour, but streaks of blood may frequently be seen in the droppings of calves affected with white scour.

The particular point of importance in connection with diarrhoea due to bacteria is that the condition is infectious, and that infection will remain in calf yards, pens and houses for long periods. The microbes which cause the condition are present in countless numbers in the excreta, and other calves running in the same pen and yards are thus liable to pick up the infection, even some months after the original case has been removed.

Infection of the calves may take place through the open navel (before healing) or later through the mouth in the food eaten.

Infection of calves through the open navel has long been recognised as a cause of white scour. The bacteria which are responsible for the condition frequently attack the joints as well as the bowels, and hence white scour is often associated with swollen and painful joints. If the animal does not die from the bowel infection and makes some recovery, it may succumb later from pneumonia. This type of infection causes illness which develops within one to three days of birth and commonly results in the death of the calf in from three to ten days.

Scours due to infection developing after the first three days, and particularly when the calf is bucket-fed, is definitely associated with the method of feeding. Under natural conditions the calf would feed upon its mother, receiving the whole milk directly from the udder, and under such conditions of feeding cases of scour very rarely occur, even when the calf is kept in contaminated surroundings; provided, of course, that navel infection has not taken place. In fact, it is difficult to cause scours in calves on their mothers, even when massive doses of infective bacilli are given by mouth. Under dairy farm conditions the calf is taken away from the cow soon after birth and is bucket-fed, being more or less gradually put on to skim milk as its main food. Some farmers depend almost entirely upon skim milk for calf raising, and others add various supplements to make up in part for the butter-fat removed in separating. Even when these supplements are added to the skim milk, the resulting food is never so satisfactory a diet as the natural food, viz., whole milk. Hence the character of the food given is itself a predisposing cause of the development of scour in that it is not the food nature intended, and calves so fed are more susceptible to disease.

Under natural conditions of feeding, the calf sucks when it feels so disposed and thus takes in its food as it requires it in the course of the day. On dairy farms, the calves are fed at varying intervals during the day, in most cases twice daily only, though sometimes more often, especially the younger ones. Hence, instead of taking in just enough milk to satisfy it for the time being, the hungry calf is taught to gulp down as much as it can in the shortest time possible—unless constant supervision is exercised the attendants hurry the calves, and the animals soon learn that if they do not make the most of their opportunity they may lose part of their meal. This is quite contrary to nature's method of feeding, and the distension of the calf's stomach with separated milk at long intervals tends to cause digestive derangement, and so is another reason why calves hand-fed tend to be readily susceptible to bacterial invasion of the stomach and bowels. If, in addition, the milk is fed cold, or is stale, the susceptibility of the animal is increased.

Again, on many farms little care is taken to keep the separated milk in a clean condition. It is held in cans, or vats, which are not regularly cleansed, and may be fed from buckets which have not been cleaned and scalded since

the last feeding time. Unless great care it taken to keep in a sanitary condition the utensils used for holding and feeding the skim milk, the liability to the development of gastro-intestinal disturbance will be increased.

As stated previously, the actual cause of inflammatory conditions of the stomach and bowels is invasion by bacteria. Different types of bacteria may be responsible and it is not intended to describe them, but it may be stated that certain types which may be normally present in the bowels of calves without causing any ill-health may, when conditions are favourable, be capable of producing disease. The favourable conditions are those produced by artificial feeding and lack of care and cleanliness in preparing and giving the food.

Finally, the organisms which cause scours are not only capable of causing inflammatory changes of the bowels. In addition to setting up pneumonia (as stated earlier in the case of white scour), they may invade the blood stream, be carried all through the body and cause death from septicaemia (blood poisoning).

Symptoms.

The first evidence of infection noticed by the farmer is the passing of watery excreta. In very young calves (particularly where navel infection is the cause) the dung is whitish or yellowish in colour, but in older calves the droppings are darker in colour and contain streaks or clots of blood. Sometimes, owing to the large amount of blood, the dung may have a reddish tinge or even a dark-red colour. Prior to the excreta becoming semi-fluid, a close observer will have noticed that it is softer than usual and is coated with slimy mucus which at times is slightly streaked with blood. As the disease progresses the dung becomes more watery, may contain bubbles of gas, and its odour is offensive. The liquid excreta becomes matted about the tail and hind quarters, and it is not difficult from this fact alone to pick out calves which are suffering, at least in some degree, from scours. Signs of abdominal pain become apparent and the calf may moan, especially when moved or when passing dung. Frequently, after the dung is passed, the animal will remain "hunched up," and make straining movements. Later it lies down continuously and refuses food, and death takes place.

Treatment.

Unless the calf is of considerable value, as in the case of pedigree or grade stock, it is frequently not an economic proposition to treat the calves affected, but it must be remembered that such animals are a danger to healthy stock unless isolated. When infection has occurred through the open navel, the majority of calves will eventually die in spite of any treatment adopted. In other cases, dosing with two ounces of castor oil, starvation for forty-eight hours, and then allowing the calf to suck its mother, instead of hand-feeding it, may lead to recovery. In any form of treatment adopted, starvation must be first carried out. If it is not desirable for the calf to be allowed to suck the mother, warm whole milk might be given in

small quantities at frequent intervals. It is essential that all the animals should be removed from the infected surroundings as soon as evidence of infection has appeared, and the sick calves must be kept in a place apart from the apparently healthy animals. In the case of illness of valuable animals veterinary assistance should be sought.

Preventive Measures.

1. If scouring in calves has occurred on the farm, the pens, yards, and houses should not be used again for calves, but new yards and pens should be erected on a fresh site. If the buildings are of solid construction and lend themselves to thorough disinfection such may be carried out, but it must be borne in mind that it is almost impossible to disinfect earthen yards satisfactorily. The new pens and yards should be so placed that they will not receive any damage from the infected yards.

2. At the first sign of scouring the apparently healthy calves should be removed to a clean paddock, and no contact (direct or indirect) should be permitted between the healthy and sick animals.

3. All feeding utensils used for sick calves should be scrubbed with soda and water and scalded well before being used for healthy calves.

4. Cows should be permitted to calve in a clean paddock (fortunately this is usually the case) and the calf should remain with the mother as long as possible. It certainly should be allowed to take the first milk (colostrum) from the mother, and it is advisable to let it feed from the mother for a longer period. Where a mixed herd is kept for milk production, the farmer's first thought is for the milk supply, and hence the calf is taken away from the mother almost immediately. In many cases this is an economic procedure because the calf is of little value. In the case of more valuable calves, the young animals should be permitted to suck the mothers for a much longer period. The longer the calf is allowed to suck the mother the less likelihood there is of the calf becoming infected with the organisms that cause scours.

5. As soon as possible after birth the navel cord should be ligatured tightly with a piece of tape that has been dipped into tincture of iodine, and the navel itself should be treated with tincture of iodine.

6. In rearing calves directly taken away from the mother, warm milk should be given for the first two weeks at least, and the change to separated milk should be gradual. The feeding utensils should be scalded after every meal and the milk kept in clean receptacles.

7. In districts where scours commonly affect calves, and where it is suspected that the farm itself is more or less infected, lime water (one cupful) and formalin (one teaspoonful) added to each gallon of milk has some preventive value. If the calves show evidence of constipation, the administration of the formalin should be discontinued.

(*To be continued.*)

Dairying Notes.

Size of Milk Wells Indicates Milking Capacity.

AFTER recording the milk yields and taking detailed measurements of 461 pedigree and grade Holstein Friesian cows in Minnesota (U.S.A.), Mr. F. H. Garner writes interestingly in the *Journal of Dairy Science* about the relationship that he found to exist between the measurements of different parts of the animals and their milk producing ability.

An Inland Dairy Herd.

With regard to measurements indicating mammary development, the writer points out that the blood leaves the udder by six different veins, and that only two of these, the so-called milk veins, are visible. Where the veins turn suddenly upwards, some 6 to 12 inches from the fore-legs, the milk-wells are produced. The question arose as to whether the milk-wells were larger on bigger cows not because of higher milk yields but to be proportionate to the frames of the cows. It was found that the size of the cow did not materially influence the size of the milk-well. Measuring size by the height at the hocks, and holding this figure constant, a positive correlation was obtained between size of milk-wells and milk yield. The writer concludes that the total area of the milk-well will take the tip of the middle finger of a normal man, and although one would never attempt to judge a cow by one point alone, the size of the milk-wells is probably

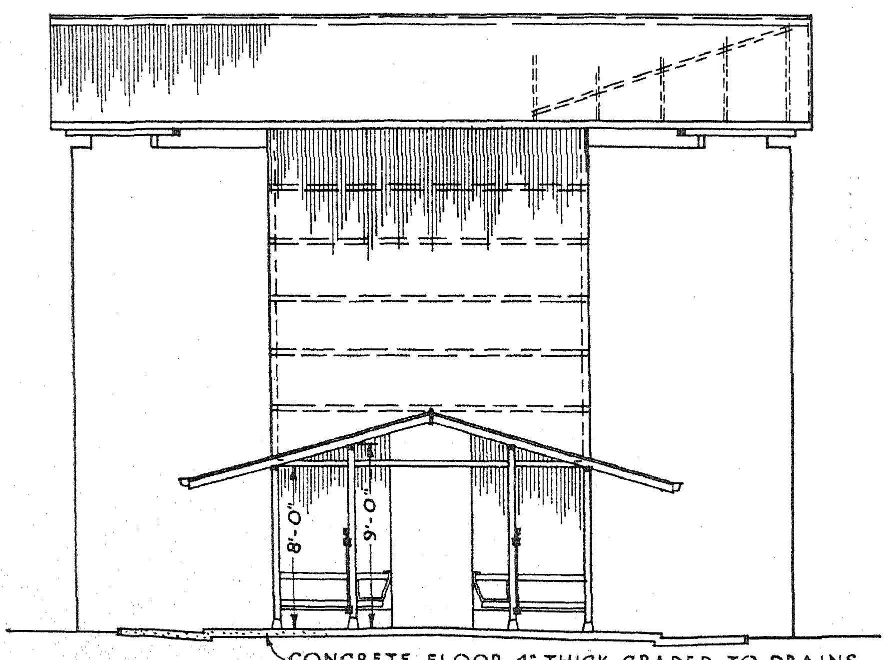
the best single point indicating milk-producing ability. It is further stated that there may be a close relationship between the size of milk-wells in parent and the milking capacity of their daughters.

The writer also found that it was important that a cow should have a long body; the relationship here was not much but nevertheless significant. He found that the height of the hindquarters of the cow was more highly correlated with milk yield than the height of the forequarters. The coefficient of correlation between yield and width at the hocks was also significant, and bears out the opinion of judges who prefer a cow with a large pelvis girdle.

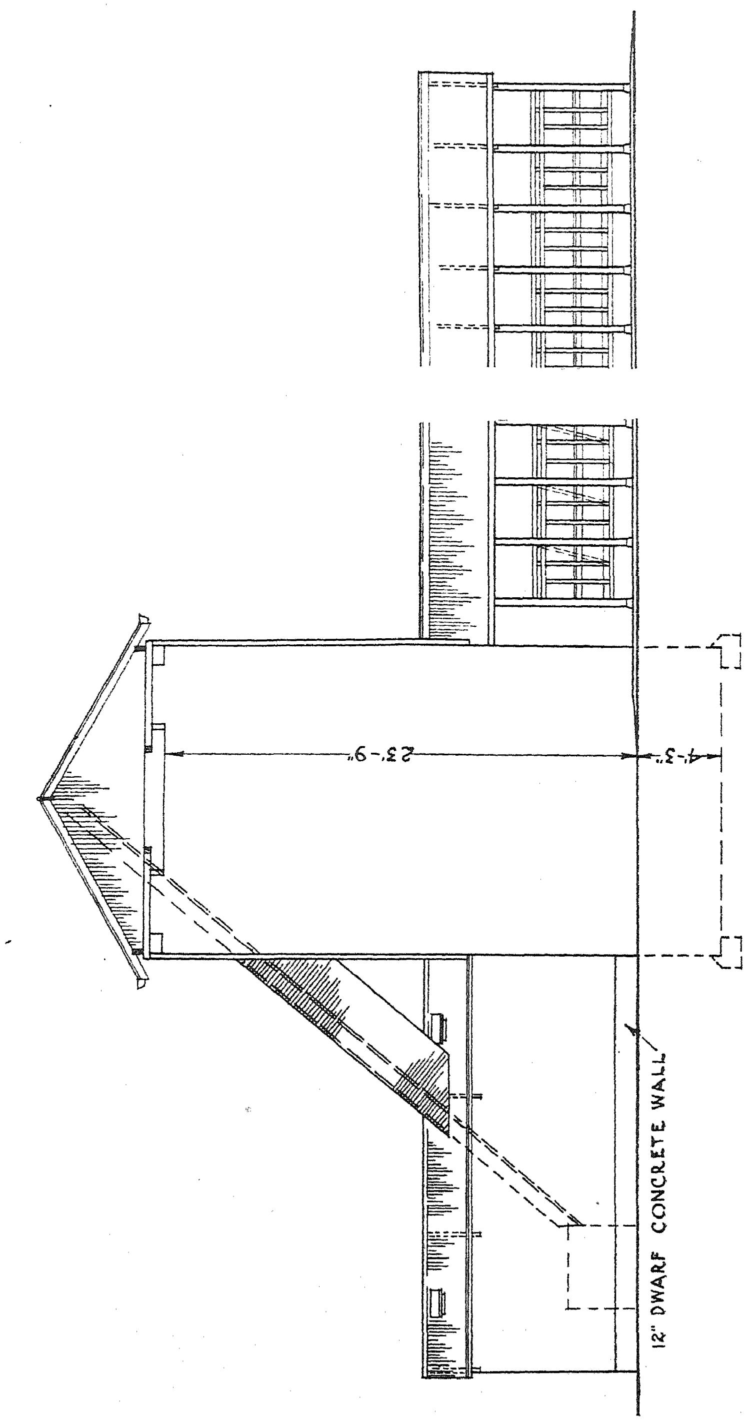
With regard to constitution, a significant correlation was obtained between the circumference of chest and milk yield, but not between depth and width of chest, though the writer concludes that these last two measurements could not be so accurately made as the first. "Capacity" was measured by the width of barrel at the thirteenth rib, and by the circumference of barrel, and again a significant correlation was obtained.

Convenience Spells Efficiency.

THE dairy farmer's lot is generally hard enough, but his difficulties are added to enormously by wet weather during the cold winter months, particularly if he has to feed his herd, which is usually the case. Comfort is worth a lot, and, as in most cases, it is a big factor in efficiency, the economics involved in farm improvements such as overhead silos, feeding



Cross Section Through Feeding Stalls, Showing Silos in Background.



Elevation of Feeding Stalls with Silo and Feed Room Attached.

stalls, and other similar conveniences, cannot always be reduced to a question of pounds, shillings, and pence; the comfort of the farmer and his herd should receive much consideration in such matters.

When it comes to a question of feeding, there is nothing more convenient than to have the silos and feed room attached to the feeding stalls. The wisdom of erecting feeding stalls needs little stressing at this season of the year. In last month's issue we reproduced ground plans of two such arrangements, and in this issue we are giving an elevation and a cross section of one of those layouts.

Soil Erosion in Dairying Districts.

SOIL erosion, said Mr. E. S. Clayton, Senior Experimentalist of the Department, in the course of an address to a recent gathering of South Coast dairy farmers, was causing the loss of considerable areas of good lands in New South Wales, and to indicate the enormous damage that might be done if preventive measures were not adopted, he instanced the total loss in America of thirty million acres of their best lands and the partial loss of another sixty to seventy million acres.

The far South Coast was subject to erosion, said Mr. Clayton, as it was largely of a hilly nature and a good deal of cultivation was undertaken on this hill country. Once the surface soil was washed away the damage could not be repaired, so it was essential to adopt preventive measures, and although the signs of erosion might not appear to be very serious at present, that was the time to commence the work of putting in contour banks to prevent development of the trouble. Mr. Clayton described how the line of these contour banks was marked out and constructed, and, for greater detail, referred his listeners to a free leaflet on the subject, which could be obtained from the Department. The contour banks had a fall of 6 to 9 inches in every 100 feet and conveyed the run-off water across the slopes and allowed it to be disposed of wherever convenient. It was surprising, said Mr. Clayton, how, after contour draining, much of the waters soaked in instead of running off as previously. This was an added advantage.

Rocks, timber and other obstructions were likely to hamper operations on coastal lands, but farmers should not be discouraged by such difficulties, nor should any farmer imagine that his particular farm was too steep or the slopes too complicated to treat in the manner suggested. The only cases that presented real difficulties were those where steep land higher up (perhaps owned by another farmer) caused a run off that washed the land lower down the slope. In timber-strewn and rocky country, a single furrow on the contour line would suffice in many cases. In any case, as the contour banks on grazing country have not to be crossed by cultivating machinery there was no necessity to build them quite so wide or high as on cropping land, for once they were constructed and grassed over, the crown of the bank was never again seriously disturbed, and consequently very little maintenance was required, it being only necessary to prevent rubbish blocking up the drain on the top side. Moreover, as only small banks were needed on grazing country they could with advantage be placed closer together.

Is Vaccination Against Contagious Abortion Valueless?

Although the Department has provided that, under exceptional circumstances, the use of vaccine against contagious abortion might be undertaken, it has consistently opposed any suggestion for indiscriminate vaccination and has on more than one occasion pointed out that vaccination with dead organisms was useless and there were grave doubts of utility of vaccination with living organisms.

Striking support of this attitude has now come to hand. Sir John McFadyean, one of the leading veterinary pathologists of Great Britain, in an article published in March of this year, comes to the following conclusions:—(1) So-called vaccination against bovine contagious abortion is an intentional infection of cows and heifers with enormous doses of the living, fully virulent cultures of the organism which is the cause of the disease; (2) notwithstanding the fact that it has been practised in hundreds of herds in this country (Great Britain) during the past twenty years, there has not yet been published satisfactory evidence that it is capable of preventing the spread of the disease or reducing the number of cases of abortion in infected herds. The inoculation of pregnant cows and heifers with living abortion bacilli is indefensible.

Again, quite recently, Jensen, whose reputation amongst veterinary bacteriologists is world-wide, has published an article on the same subject and expresses the opinion that vaccination with living cultures has not an immunising effect which would justify its general employment. Jensen points out that "the first experiments carried out were with serum, and after that a combination of serum and bacillary extracts, partly with killed cultures. Later, killed cultures were exclusively employed. Examination of results make it clear that these methods of treatment were devoid of value. Vaccination experiments with living culture were then undertaken. The result of the first set of experiments showed that no great value could be attached to vaccination with living cultures, and then other lines of treatment were tried. Later, further experiments with living cultures were undertaken, and the results were bad and showed that the vaccination had no particular effect."

From this it will be seen that notwithstanding the statements which are at times made regarding vaccination against contagious abortion, two of the greatest authorities on the subject definitely indicate that the method has no value. It might be pointed out that vaccination with a living vaccine has the effect of infecting those animals which are not already infected.

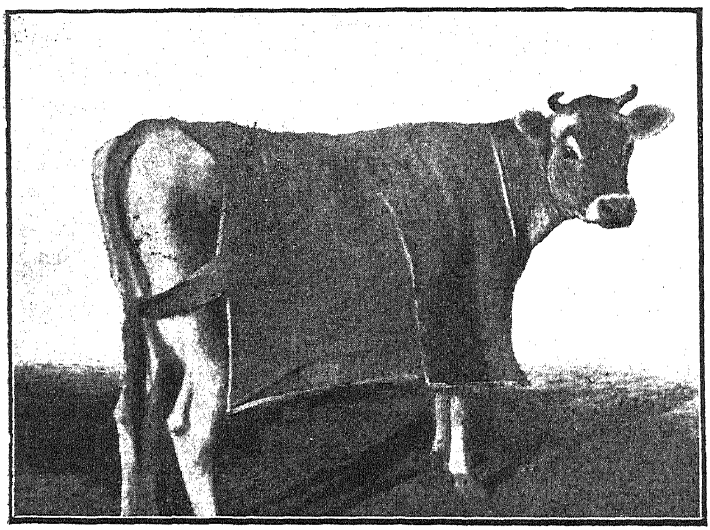
It is very easy to be misled in dealing with alleged methods for treating contagious abortion, because so many cows, although still infected, will not abort the second time. If after the first abortion these cattle are treated in some way or other there is a tendency to assume that because they do not abort a second time they are therefore cured. Such is not the case; nearly all of them are still infected and would be a source of infection to other cattle.

Stockowners are, therefore, warned to be extremely cautious in accepting any statements or claims made regarding the vaccination of cows against

this disease. It must be recognised that if vaccination with living virulent organisms has so little effect, the use of dead organisms or bacillary extracts cannot be expected to be efficient.—MAX HENRY, Chief Veterinary Surgeon.

Rugs Save the Feed Bill.

A RUGGING is almost as good as a feed, for much of the food a cow consumes in the winter months goes to maintain body heat. A rug will help to do this, and at much less cost, particularly if the farmer is handy enough to make his own rugs out of corn, wheat, or flour sacks. These are quite warm, and after they have absorbed some of the oil, etc., from the cow's body, they become almost waterproof.



Two bags, or three for larger cows, will make a nice rug. Split them down the seams and join together and place on the cow. Next cut off a strip from 10 to 18 inches wide so that the rug will not hang too low. This need not be wasted: it is folded, and when sewn to the rug provides the strap for the thighs, this being the only strap used. The front is now fitted by turning up the front corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion which the cow would tread on. The two turned-back portions are then measured and sewn to fit fairly tightly to the cow's neck. The back strap is fitted 12 to 15 inches below the rump level, and the rug is complete.

Effect of Metals on Vitamin Content of Milk.

ACCORDING to Schieblich (in *Deut. Nahr. Rundschan*) when milk is pasteurised in copper, aluminium and nickel vessels, a small amount of these metals is taken up by the heated milk. Copper destroys Vitamin C, while aluminium has no effect. Nickel is without effect on Vitamins A, B, and C.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	226	2 July, 1933
Grafton Experiment Farm	271	14 ,, 1933
P. Ubrihien, Corridgeree, Bega	123	15 ,, 1933
W. Hammond, Bellingen	80	16 ,, 1933
William Thompson Masonic School, Baulkham Hills	37	20 ,, 1933
A. Shaw, " Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 ,, 1933
G .V. Ralston, " Porphyry," Seaham	98	21 ,, 1933
E. C. Nicholson, Jillamatong, Corowa	180	23 ,, 1933
St. John's College, Woodlawn, Lismore	47	23 ,, 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook	37	17 Aug., 1933
A. L. Logue, Thornboro, Muswellbrook	36	17 ,, 1933
E. W. Flower, Binna Burra	56	18 ,, 1933
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	43	25 ,, 1933
Sacred Heart Convent, Bowral	10	26 ,, 1933
Lunacy Department, Parramatta Mental Hospital	12	1 Sept., 1933
Department of Education, Gosford Farm Homes	38	2 ,, 1933
James McCormack, Tumut	98	9 ,, 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1933
G. Powell and Sons, " Loch Lomond," Armidale	22	26 ,, 1933
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1933
E. E. McMullen, Springnook, Holbrook	31	3 Nov., 1933
W. R. Boughton, Holbrook	33	3 ,, 1933
C. Maynard, Holbrook	12	3 ,, 1933
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1933
Stace Bros., Taylor-street, Armidale	26	1 Dec., 1933
J. L. W. Barton, Wallerawang	20	1 ,, 1933
Department of Education, Brush Farm, Eastwood	8	3 ,, 1933
Lunacy Department, Morisset Mental Hospital	29	7 ,, 1933
W. W. Martin, " Narooma," Urana Road, Wagga	150	14 ,, 1933
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1933
E. E. Winder, Wybong Road, Muswellbrook	40	22 ,, 1933
C. J. Parbery, Allawah, Bega	122	8 Jan., 1934
Strickland Convalescent Hospital for Women, " Carrara," Rose Bay ...	8	9 ,, 1934
G. H. Hooper, Oak Hill, Bethungra	10	19 ,, 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	81	22 ,, 1934
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	13	27 ,, 1934
J. B. Burtenshaw, " Sunnyside," Inverell	42	27 ,, 1934
Parker Bros., Hampton Court Dairy, Inverell	82	27 ,, 1934
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1934
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1934
W. K. Frizell, Rosenstein Dairy, Inverell...	37	2 ,, 1934
W. Pigg, Redlands Dairy, Inverell	27	2 ,, 1934
A. N. de Fraine, Happy Valley Dairy, Inverell	28	3 ,, 1934
G. L. Genge, " Easton," Armidale	39	7 ,, 1934
J. Davies, Puen Buen, Scone (Jerseys)	191	9 ,, 1934
Forster & Sons, Abington, Armidale	189	12 ,, 1934
A. B. Finney, Fox Ground, Gerringong	33	17 ,, 1934
Newington State Hospital and Home	91	16 ,, 1934
Lidcombe State Hospital and Home	153	20 ,, 1934
Lunacy Dept., Gladesville Mental Hospital	34	22 ,, 1934
Riverina Welfare Farm, Yanco	89	24 ,, 1934
Department of Education, Yanco Agricultural High School	39	24 ,, 1934
W. J. Miller, 199 Mann Street, Armidale	7	6 Mar., 1934
New England Girls' Grammar School, Armidale...	41	8 ,, 1934
F. C. Butler, Yarranung, Bega	122	24 ,, 1934
G. W. Young, " Boorganna," via Wingham	39	30 ,, 1934
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
A. D. Frater, " Fairview Dairy," Inverell	61	5 ,, 1934
Cowra Experiment Farm	26	27 ,, 1934
St. Joseph's Girls Orphanage, Kenmore	19	4 May, 1934
G. A. Parish, Jerseyland, Berry	93	5 ,, 1934
Marion Hill Convent of Mercy, Goulburn	27	5 ,, 1934
Australian Missionary College, Cooranbong	72	5 ,, 1934
St. Joseph's Convent, Reynold-street, Goulburn	4	5 ,, 1934
St. John's Boys' Orphanage, Goulburn	18	5 ,, 1934
W. M. McLean, Five Islands Road, Unanderra	76	6 ,, 1934
Koyong School, Moss Vale	3	8 ,, 1934
Miss N. C. Brenan, Arankamp, Bowral	15	10 ,, 1934

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
Tudor House School, Moss Vale ...	21	13 May, 1934
Limond Bros., Morisset ...	38	1 June, 1934
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	29	2 „ 1934
Hurlstone Agricultural High School, Glenfield ...	44	22 „ 1934
St. Patrick's College, Goulburn ...	8	21 Sept.. 1934
S. L. Wills, Greendale Dairy, Cowra ...	28	27 „ 1934
Wagga Experiment Farm (Jerseys) ...	60	25 Oct.. 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	92	9 Nov., 1934
Wolaroi College, Orange ...	11	10 „ 1934
Wollongbar Experiment Farm, Lismore (Guernseys) ...	123	11 Jan.. 1935
George Rose, Aylmerton ...	2	21 Feb., 1935
Mittagong Farm Homes ...	36	22 „ 1935
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	18	23 „ 1935
T. H. Maples, Racecourse Farm, Bega ...	48	2 Mar., 1935
P. M. Burtenshaw, Killean, Inverell ...	63	28 „ 1935
J. P. McQuillan, Bethungra Hotel, Bethungra ...	25	4 April, 1935
W. Newcomb, "Minnamurra," Inverell ...	85	6 „ 1935
Lunacy Department, Kenmore Mental Hospital ...	84	4 May, 1935
St. Michael's Novitiate, Goulburn ...	4	4 „ 1935
Rydalmere Mental Hospital ...	65	11 „ 1935

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—MAX HENRY, Chief Veterinary Surgeon.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free.

Owner and Address.	Number in herd.
Martin Bros., "Narooma," Urana Road, Wagga Wagga ...	86
Cann, H. J., The Gap, Alstonville ...	...
McSweeney, W., The Rivers, Canowindra ...	169
White, F. J. and Sons, Bald Blair, Guyra ...	238
Mott, T., Main Arm, Mullumbimby ...	25
Henderson & Son, Upper Wantagong, Holbrook ...	95
J. T. Hawk, Ben Lomond ...	42
C. R. Sams, Wilson's Creek, Mullumbimby ...	34

—MAX HENRY, Chief Veterinary Surgeon.

INFECTIOUS DISEASES REPORTED IN MAY.

THE following outbreaks of the more important infectious diseases were reported during the month of May, 1933:—

Anthrax ...	Nil.
Blackleg ...	4
Piroplasmosis (tick fever) ...	Nil.
Pleuro-pneumonia contagiosa ...	1
Swine fever ...	Nil.
Contagious pneumonia ...	2
Necrotic enteritis ...	2

—MAX HENRY, Chief Veterinary Surgeon.

Visceral Gout in Poultry.

L. HART, B.V.Sc., H.D.A., Veterinary Research Station, Glenfield.

AMONG the diseases of lesser economic importance in poultry is the interesting condition known as visceral gout. That the disease is a comparatively rare one is indicated by the fact that only two cases have occurred in specimens submitted to Glenfield Research Station during the last three years, one of these was quite recently.

Gout in poultry may occur in two different forms:—

Joint form, in which the joints of the legs and feet are attacked, the disease being readily recognised by the marked, painful swelling of the affected joints.

Visceral form, in which the internal organs are affected, the disease being recognisable only after death.

As visceral gout is progressive and an affected bird may live for a long period without showing any symptoms, it is possible that such a bird may be killed for the table, the lesions being recognised at time of dressing. The poultryman will probably wonder what is wrong with the bird, and it is with a view to enlightening him on this that the present article is written.

The Cause is Somewhat Obscure.

The exact cause of the disease is somewhat obscure, but the main factor is a diet excessively rich in proteins. Disease of the kidneys may also be responsible, whilst lack of exercise through close confinement is a predisposing factor.

Fowls are most commonly affected, the heavier breeds being most susceptible, but geese and pigeons may also suffer.

The complaint is characterised by the accumulation of masses of white, chalky or mortar-like material on the surface of the internal organs of the body. This material may be seen covering the membranes which line the body cavity (pleurae and peritoneum), the surfaces of the liver, intestines, spleen, lungs, kidneys and heart, so that the inside of the bird has the appearance of having been dusted with chalk or powdered mortar. In addition to the chalky deposition on the outside of the pericardium (bag around the heart) the chalky material is often deposited in a thick mass on the inside of the pericardium, causing it to become adherent to the heart. The kidneys are generally enlarged, pale, and contain deposits of the same white material, whilst running back from them are two cords (the ureters), packed with white deposits; this condition of the kidneys and ureters resembles that seen in fowls which have died through lack of green feed. The above symptoms may be seen in varying degrees, depending on the severity of the disease.

Owing to the fact that the disease occurs so rarely, an attempt at prevention of further cases seems unwarranted, although something may be done by regulating the diet, particularly by providing ample green feed.

Poultry Notes.

July.

E. HADLINGTON, Poultry Expert.

Essentials in Chicken Rearing.

THE chicken rearing season should by the end of this month be in full swing, and, with the large number of newcomers into the industry, there will doubtless be more than the usual crop of troubles during the brooding stage. Some advice on the main essentials in rearing may, therefore, be given, especially for the guidance of the beginner.

In the first place, it should be realised that rearing chickens is one of the most difficult operations on a poultry farm. Upon the ability of the farmer to successfully rear the young stock largely depends the amount of profit derived from the resultant pullets and also market birds. Every effort should therefore be made to ensure that the chickens do not suffer any set-back in their early life, and the best means of avoiding this is the adoption of a suitable and adequate brooding system.

The chief essential in any brooding system is that it should be possible to maintain sufficient heat to prevent crowding and at the same time allow of ample ventilation. Provision should also be made for chickens to move away from the heat if excessive, without any obstruction. This means that the brooder should be capable of generating a temperature of at least 90 degrees Fahr. for the young chicks in the coldest weather, and in any box type at least one side should be fitted with a curtain through which the chickens can move to a cooler zone if the brooder becomes overheated.

Another important matter is the number of chickens put into a brooder, and in this regard it should be borne in mind that the smaller the numbers the better are the chances of success. This applies particularly to the inexperienced operator, but many farmers with years of experience would have less difficulty in rearing good chickens if they ran smaller numbers together. For instance, in a brooding system with a number of separate units to accommodate, say, 100 day-old chicks, it would be preferable to put in eighty or ninety at first, and decrease the numbers each week or so, as the chickens grow, so that at the end of six weeks they would be reduced to about fifty or less. In the case of colony brooders, it has become generally recognised that with more than 300 to 350 chickens in one brooder the risk of heavy losses is much greater, and many of the chickens do not develop as they should on account of the stronger ones trampling over them when feeding.

If it were realised that overcrowding is one of the greatest evils in chicken rearing, and, apart perhaps from insufficient warmth, is responsible for most of the troubles met with, there would be a much lower rate of mortality than at present.

Feeding Chickens.

IN response to many inquiries regarding the feeding of chickens, particulars of the ration fed at all Government farms are given hereunder:—

1.—**Chickens coming from the incubators** are allowed to fast during the first thirty-six to forty hours from actual hatching time.

2.—**For the first two days** they are fed on *dry rolled oats,* such as is used for breakfast porridge. If the oats are crumbled between the hands a little they will be more readily eaten by the baby chickens.

3.—**From two days to six weeks** they are fed five times per day—four times on moist crumbly mash, and once on chicken mixture. The latter should be the last feed of the day late in the afternoon.

4.—**From six weeks to twelve weeks** four times per day—three times on mash and once on mixed grain ration, consisting of wheat and cracked maize instead of the chicken mixture. The grain ration should be the last feed of the day.

5.—**From twelve to twenty-four weeks** they are given the morning mash fed to adult birds (60 lb. pollard, 34 lb. bran, 6 lb. M.I.B. meat meal, 22 oz. salt), with an extra feed of simple mash (*without meat meal*) at midday, and the adult grain ration (two-thirds wheat, one-third crushed maize) in the evening.

Formula for Mash for Chickens.

Up to twelve weeks of age (as for Nos. 3 and 4 above) a mash is used consisting of one-third by weight of bran and two-thirds by weight of pollard, mixed with hot skim milk, if procurable; one ounce of fine salt is dissolved in the milk (or water) to every 5 lb. of ingredients to be mixed. Two feeds per day contain 1 oz. M.I.B. bone meal to each 1 lb. of mash. There is no necessity to mix the mash more than twice per day.

The simple system of feeding described has been in use at the various Government farms for many years, and has given the best of results in the development of the chickens, with a minimum of mortality.

How to Mix Mash for Chickens.

The method recommended for mixing the mash for chickens is as follows:—Take the proportion of bran, place it in a tub or other receptacle, and pour over it as much milk or other liquid as will be absorbed by it, then work in the proportion of pollard and make into a crumbly mash. Should the pollard be finer than the average, up to half bran may be used quite safely, and will not be found to cause trouble. There is little or no objection to the increased quantity of bran, because there is so little difference in the food values of bran and pollard that no material alteration is made in the nutritive ratio or value of the ration. Bran does not act on poultry in the same way as it is usually assumed to do on other animals.

Milk for Chickens.

The value of milk for chickens is generally recognised, but it is perhaps not so well understood that when fed in conjunction with other foods it has a value far beyond that which its chemical constituents would indicate. Milk is of great value as a liquid with which to mix the soft food, owing principally to its vitamin content.

Many operators give their chickens milk to drink. This may work well enough with small lots run with hens, but it is most objectionable and dangerous when large numbers are run together in heated brooders, or where they have to crowd together for warmth. Milk cannot be given to chickens to drink without their down and feathers becoming besmeared with it, and an insanitary condition is thus created which is likely to encourage disease—in fact, it may bring on the very condition that one often sees sour milk recommended to cure, namely, diarrhoea.

In no circumstances should milk form the only liquid given to chickens to drink. Water should always be available to them in addition.

Skim Milk Powder.

Skim milk powder can be used in place of ordinary skim milk, at the rate of 1 lb. to each gallon of water required to mix the mash. The powder should be dissolved in the water.

Skim milk powder can be fed in dry mash if desired, 1 lb. of powder to 20 lb. of mash being the correct proportion.

Sundry Requirements.

Green feed should be given, if possible, regularly every day to chickens from a week old.

Small sea-shell grit should be always before them.

Meat Meal Experiments.

THE question as to the quantity of meat meal required in a ration for laying hens to give the best results has exercised the minds of poultry farmers for a number of years, and many have in the past used as high as 15 per cent. in an endeavour to increase egg production. In England and America it appears to be the general practice to use 10 per cent. or more in the laying rations, and during my tour of these countries I found that most of the experiment work carried out in this connection was with high percentages, and there appeared to be no data available regarding the use of smaller quantities. The results of five experiments with more limited proportions of meal carried out at Hawkesbury Agricultural College in different years should, therefore, be of considerable interest to poultry farmers both here and overseas.

These experiments were commenced in 1924-25, and continued in 1925-26, 1926-27, 1931-32, and 1932-33; other work prevented the tests being carried on during the years intervening between 1927 and 1931. The results of the

tests up to and including 1931-32 have previously been published, but, for purposes of comparison, particulars are given again, together with those for the fifth experiment just concluded.

In laying down these tests, every effort was made to ensure uniformity, and with this in view a selection was made of birds bred as nearly as possible on the same lines and of similar age. These were placed in the pens a few weeks before the eggs were recorded, and during that time the birds were graded, so as to ensure that each group was as even as possible as regards laying. In the first two tests pens were included to which no meat meal was given, but the results, as expected, were not satisfactory, so in the following year the "no meat meal" pens were omitted, and three groups were fed on 2½ per cent., 5 per cent., and 7½ per cent. In 1931-32 and last year the 2½ per cent. lot was discontinued, and 5, 7½, and 10 per cent. was fed to three groups. White Leghorns were used in all experiments. The ration consisted of wet mash in the morning and grain for the evening feed. The morning mash consisted of approximately two-thirds pollard and one-third bran, with the addition of meat meal as indicated in the various tables; common salt was used in the mash at the rate of 22 oz. per 100 lb. The evening feed consisted of two-thirds wheat and one-third maize.

The first test, commenced in 1924, was more or less of a preliminary nature, covering the flush season of production (September to March), and it will be noted that the 1926–27 experiment covered a period of ten months only, owing to pens not being available to continue for the full year; but all the other experiments were carried on for a complete year.

The 1924–25 Test.

——		Meat meal.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Average per hen.
		per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1	...	Nil.	786	718	693	624	567	269	86	3,643	91
Lot 2	...	2½	761	764	637	615	492	271	146	3,686	92
Lot 3	...	5	784	816	704	716	600	399	246	4,265	106·6
Lot 4	...	7½	744	795	661	674	584	401	286	4,145	103·6

Each lot consisted of two pens of twenty birds.

The 1925–26 Test.

——		Meat meal.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total.	Average per hen.
		Per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1	...	Nil.	101	116	396	547	629	629	467	526	431	311	200	10	4,363	109
Lot 2	...	2½	145	263	399	669	650	718	669	584	578	345	308	101	5,429	135
Lot 3	...	5	1	257	396	694	685	693	554	567	395	291	256	93	5,112	127
Lot 4	...	7½	257	329	509	761	774	727	606	616	544	346	313	100	5,882	147

Each lot consisted of two pens of twenty birds.

The 1926–27 Test (Ten Months).

—	Meat meal.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Average per hen.
	per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1—60 pullets	2½	621	772	1,037	1,211	1,126	1,035	959	613	410	250	8,034	133·9
Lot 2—40 pullets	5	357	504	669	800	773	708	652	453	320	195	5,431	135·7
Lot 3—60 pullets	7½	596	810	1,052	1,178	1,191	1,115	1,010	639	568	413	8,572	142·8

Lots 1 and 3 consisted of three pens of twenty birds, and Lot 2 of two pens of twenty birds.

The 1931–32 Test.

—	Meat meal.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total.	Average per hen.
	per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1 ...	5	350	368	513	585	609	606	545	532	285	319	278	167	5,157	172
Lot 2 ...	7½	386	435	507	554	588	591	511	506	383	421	330	230	5,442	181
Lot 3 ...	10	488	503	562	629	614	622	568	508	441	452	375	230	5,994	200

Each lot consisted of three pens of ten birds.

Analysis of 1931–32 Test, showing Eggs per Pen.

Month.	5 per cent. meat meal.			7½ per cent. meat meal.			10 per cent. meat meal.		
	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
May	127	85	138	150	104	132	158	148	182
June	111	112	145	158	132	145	177	171	157
July	172	170	171	170	140	197	190	192	180
August ...	197	193	195	196	161	197	223	216	190
September ...	221	190	198	219	175	194	205	213	196
October ...	210	196	200	195	183	213	198	223	201
November ...	188	196	161	160	147	204	174	208	186
December ...	174	211	147	173	144	189	171	172	165
January ...	83	119	83	155	112	116	124	166	151
February ...	108	143	68	181	96	144	130	167	155
March	93	87	98	128	83	119	98	166	111
April	47	60	60	88	54	88	54	106	70
Total ...	1,731	1,762	1,664	1,974	1,531	1,938	1,902	2,148	1,944

The 1932–33 Test.

—	Meat meal.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Total.	Average per hen.
	per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1 ...	5	437	476	584	553	638	592	473	413	328	258	93	53	4,898	163·8
Lot 2 ...	7½	393	445	570	560	605	545	451	418	356	302	157	89	4,891	163·1
Lot 3 ...	10	455	501	575	511	575	553	484	420	300	263	173	125	4,935	164·1

Each lot consisted of three pens of ten birds.

ANALYSIS of 1932-33 Test, showing Eggs per Pen.

Month.	5 per cent. meat meal.			7½ per cent. meat meal.			10 per cent. meat meal.		
	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
June	150	143	144	127	135	131	144	140	171
July	168	141	167	149	145	151	184	166	151
August ...	204	189	191	189	173	208	206	190	179
September ...	195	167	191	188	179	193	184	163	164
October ...	218	198	222	192	188	225	209	186	180
November ...	200	192	200	182	187	176	194	185	174
December ...	151	165	157	153	167	131	187	138	159
January ...	157	137	119	154	137	127	171	105	144
February ...	128	101	99	114	125	117	103	82	115
March	92	70	96	84	113	105	113	68	82
April	40	26	27	61	40	56	78	22	73
May	5	37	11	45	36	8	46	34	45
Total ...	1,708	1,566	1,624	1,638	1,625	1,628	1,819	1,479	1,637

Summary.

Throughout the various experiments there are a number of contradictory features, for instance:—

In the 1924-25 test, it will be seen from the table given, the group receiving 5 per cent. meat meal laid an average of three eggs per bird more than the birds fed 7½ per cent.

In 1925-26 the birds fed on 2½ per cent. meat meal laid an average of eight eggs per bird more than those in the 5 per cent. pens, whereas the 7½ per cent. lot laid twelve eggs per bird more than those being fed 2½ per cent., and twenty per bird more than those receiving 5 per cent.

1926-27.—In this year the test was continued for ten months only, and during this period there was a gradual increase in production in proportion to the amount of meat meal fed, but there was a difference of only 1.8 eggs per bird between the 2½ per cent. and the 5 per cent. pens, and 7.1 eggs per bird between the 5 per cent. and the 7½ per cent. groups.

1931-32.—In this year again there was a gradual increase in production between the different groups, in accordance with the percentage of meat meal fed, but there is a big variation in the production of the various pens comprising each group, as will be seen from a reference to the totals in the table setting out the production of each pen. These results show that production in the 5 per cent. pens was fairly uniform, whilst in the 7½ per cent. group two pens laid an almost equal number of eggs, and one laid over 400 eggs less. On the other hand, the production from two pens in the 10 per cent. group was practically the same, yet the third pen laid over 200 eggs more, and, if the two even pens in both the 7½ per cent. and 10 per cent. groups are compared, the result is in favour of the 7½ per cent.

1932-33.—In this last experiment, there is practically no difference in the production from any of the groups, the averages being: 5 per cent., 163.8; 7½ per cent., 163.1; 10 per cent., 164.1. Here again, the figures showing the

total eggs laid by each pen exhibit a lack of uniformity of production, except in the three pens fed 7½ per cent. meal. There is a difference between the lowest and highest pens in the 5 per cent. lot of 142 eggs, whereas in the 10 per cent. group the difference between the highest and the lowest is 340 eggs, and upon reference to the monthly totals it will be noted that during the months of August, October, and November the 5 per cent. pens laid a greater number than either the 7½ per cent. or the 10 per cent. groups, while in September, February and March the 7½ per cent. lot laid the highest number, but those receiving 10 per cent. laid somewhat better during the months of June, July, December, January, April and May.

From a general survey of the five years' results it is difficult to draw any definite conclusions, but it would appear that there is no outstanding advantage in feeding more meat meal than is necessary to give a ratio of between 1:4.5 and 1:5.0, which has always been looked upon as the correct ratio for adult poultry feeding, and is the basis adopted in the ration advocated by the Department and fed to the birds in the Hawkesbury Agricultural College laying competition and on Government farms. This ration provides for the use of 6 per cent. of meat meal having a 60 per cent. protein content.

There is one feature, however, which perhaps warrants further experiment, and that is that in most of these experiments (in the case of the last test the increase was greater in April and May), the birds receiving 10 per cent. of meat meal showed a higher production during the months of February and March. This would appear to indicate that 10 per cent. of meat meal may be an advantage during the moulting season, but in view of the variation in the results of these tests it would probably require several years' experiment to prove the matter.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

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Wagga (F. H. Croaker) ...	... „ 22 to 24
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Parkes (L. S. Seaborn) ...	... „ 29, 30
Young (T. B. Tester) ...	... „ 29 to 31
Lake Cargelligo (C. W. Hutchens)	„ 30, 31
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Gosford	... „ 1, 2
Forbes (E. A. Austin) ...	... „ 5, 6
Murrumburrah (W. Worner)	... „ 5, 6
Ungarie (D. R. Bedford)...	... „ 6
Singleton (J. T. McMahon)	... „ 6 to 8
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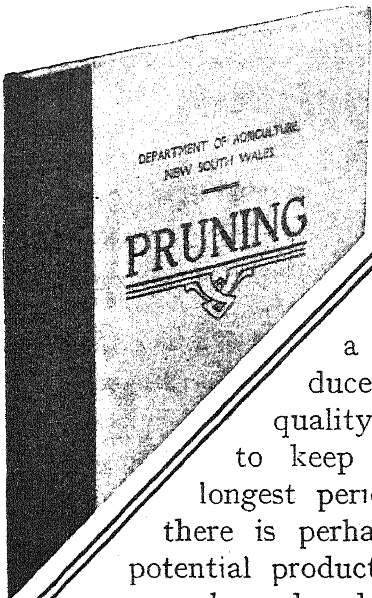
DEPARTMENT OF AGRICULTURE

NEW SOUTH WALES



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A Boost for Pit Silage.

INLAND DISTRICTS FODDER CONSERVATION CHAMPIONSHIP, 1933.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

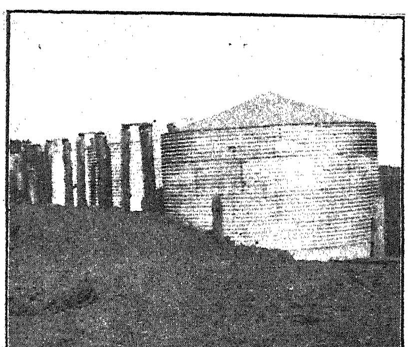
Various farmers' organisations promote district fodder conservation competitions each year and the winners of these become eligible to compete for championship honours.

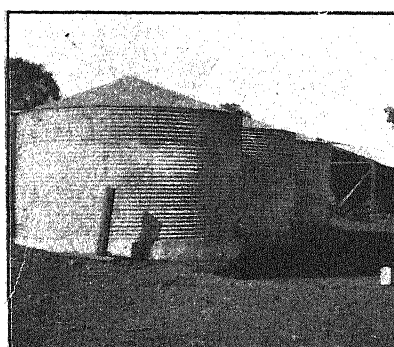
An outstanding feature this year was that all competitors except one relied on silage conserved in trench silos as the basis of their fodder reserves. This is a distinct advance on previous years; for instance, only half the competitors in the previous year's competition had conserved silage.

Stockowners generally are realising that silage is a better form than hay in which to conserve fodder over lengthy periods. Being succulent and laxative, silage is preferred for feeding stock during drought periods. Moreover, fodder can be conserved as silage more cheaply and safely than as hay, for when the pit is filled and covered with earth it is safe from damage by weather, fire, stock, mice or other pests, and no outlay is required for sheds, mouse-proof straddles or fences, as is required for the protection of hay, nor is there the necessity for the payment of premiums for fire insurance.

Increased Interest Being Shown.

THERE was a very satisfactory improvement shown this year in the Championship Fodder Conservation Competition in Inland Districts, both as regards the number of entries and the high standard of the fodder reserves.





Oat Tank Silos at Alectown.

Left: Showing earth ramp as back to facilitate filling. *Right*: Front view of same silos. Note how the ground has been graded to facilitate emptying the silos.

For the purpose of the championship it was necessary to combine the Middle West, Central South-west and Northern Divisions; unfortunately there were no entries at all in the Riverina Division. Ten districts were

* Mr. Stening judged this championship competition, which is promoted by the Royal Agricultural Society.

represented, which is an increase of four on the entries in the previous year's competition, the societies being Ariah Park, Bogan Gate, Boggabri, Canowindra, Gunnedah, Parkes, Peak Hill, Trundle, Wee Waa and Wellington. This response is quite encouraging, particularly when there is taken into consideration the great difficulties that are being experienced by primary producers generally at the present time of economic stress, and also the dry conditions which have ruled since early spring, in consequence of which heavy inroads had already been made into fodder reserves.

At no time can a very marked increase in entries be expected, nor is this the object of fodder conservation competitions, the chief aim being to encourage stockowners to make provision against the inevitable droughts, and to focus attention on the most suitable methods of conserving fodder. That success has been achieved in this direction is now quite apparent; efforts in the past to induce stockowners to conserve fodder have been unavailing, but there are now clear indications that the examples set by the competitors in these competitions are being followed by many district farmers and graziers, and that the conservation of fodder is being more widely practised.

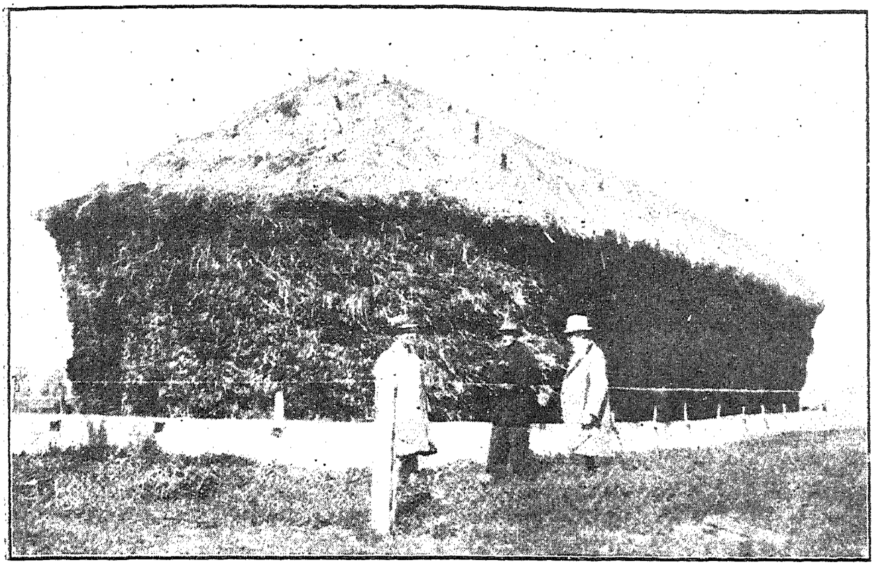
Championship Conditions and Awards.

The conditions and scale of points for judging the competitions in inland districts are as follows:—

Fodders Eligible for Conservation to be.—Concentrates (including all grains); or roughage—as hay (*e.g.*, lucerne, oaten, wheaten, barley, clover, grass), straw, or silage—and any other fodder suitable for conservation; to have been produced on the land owned, leased or held on shares by the competitor. No farmer or grazier whose holding consists of less than 150 acres will be eligible to compete.

Scale of Points for Judging—Areas other than Coastal.

		Points.
1. *Suitability and Quality of Fodder* ...		60
(*a*) Judged according to suitability of fodder or combination of fodders for the purposes for which they are required...	25	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values ...	35	
2. *Location and Protection* ...		45
(*a*) Locality—location of the site, having regard to fire, flood, economy in feeding, and general access...	10	
(*b*) Protection—protection from weather, pests, stock, fire, and general deterioration ...	35	
3. *Economy of Production* ...		15
Including land value, production, storage, and feeding costs.		
4. *Carrying Capacity* ...		60
Quantity for requirements of competitor's holding to be based on the sheep-carrying capacity of the holding (when improved and under natural pasture). The maximum amount considered to be competitor's requirements per sheep to be 5 cwt. lucerne hay or its equivalent in feeding value. (1 cwt. lucerne hay = $1\frac{1}{2}$ cwt. cereal hay = 3 cwt. silage = 4 cwt. straw = $\frac{1}{2}$ cwt. grain).		
Total ...		180



Well Built, Well Thatched, and Well Protected from Mice and Stock.

A Stack Built on Straddles for Protection Against Mice.

Judging was commenced at Wellington on 8th May, and was completed at Wee Waa on 17th idem. The awards made were as follows:—

AWARDS in the Inland Districts Championship, 1933.

Society.	Competitor.	Suitability.	Quality.	Location.	Protection.	Economy of Production.	Carrying Capacity.	Total.
	Maximum points—	25	35	10	35	15	60	...
Trundle ...	K. Gault, "Lynwood," Trundle ...	23	31	9	32	14	60	169
Ariah Park ...	D. W. Edis, "Prestonville," Ariah Park.	20	32	9	33	14	60	168
Canowindra	F. B. Hinton, "Killarney," Canowindra.	23	32	8	32	13	57	165
Parkes ...	A. P. Unger, "Stoney Hill," Alectown	19	31	8	31	13	60	162
Wellington ...	H. J. Hobden, "Bogan Villa," Geurie	18	27	8	28	12	60	153
Boggabri ...	J. B. White & Sons, "Braymont," Boggabri.	23	32	9	32	13	41	150
Bogan Gate	W. Scott, "Deloraine," Bogan Gate...	18	32	9	32	13	44	148
Peak Hill ...	W. H. Swain, "Riverview," Peak Hill	19	31	8	32	13	35	138
Gunnedah ...	A. Campbell, "Beulah," Mary's Mount, Gunnedah.	19	30	9	31	13	35	137
Wee Waa ...	J. L. Schwager, "Cardonis," Wee Waa.	17	30	9	30	12	11	109

Mr. K. Gault's Second Championship.

This is the second year in succession that Mr. K. Gault has won the championship, and it is an honour well deserved, as he has given a fine demonstration of the economical conservation of fodder on a wheat farm which is by no means favoured as regards soil or climatic conditions. The area of his property is 1,161 acres, of which about 450 acres are natural pasture, 400 acres sown with cereals and 257 acres fallowed. There is an established stand of lucerne on 10 acres, and Mr. Gault is so satisfied with its success that he recently sowed another 40 acres. The main reserve of fodder was 293 tons of silage conserved in 1931 in three trench silos, and made from a crop of wild oats. Nine small round stacks of cereal hay, containing a total weight of 135 tons, were well built on timber dunnage, and each surrounded by a galvanised iron fence to protect the hay from the ravages of mice. The stacks were neatly set out in two rows, well separated from one another as a safeguard against fire, and the whole securely fenced against stock. With 7 tons of wheaten chaff stored in a shed, the total weight of cereal hay was brought to 142 tons. Two stacks of lucerne hay, to a total of 11½ tons, also built on dunnage, were thatched with loose straw and fenced against stock. There was 98 tons of wheat grain, some of which was in bags, but the bulk was stored in small galvanised iron silos 12 feet in diameter and 8 feet high, of which there were four. The quality of the whole of the fodder was very good, and the total quantity was nearly three times the stipulated requirements, based on the carrying capacity of the holding. Thus Mr. Gault, who has accumulated his reserves at comparatively

small cost, is in a position to defy any drought that is likely to occur, and his fodder is so well protected that there is very little chance of it deteriorating, even if it is necessary to hold it for many years before being required.

The second prize was won by Mr. D. W. Edis, who was successful in winning a championship in 1931 and third prize last year. On this property of 820 acres only 26 acres have been left in natural grasses, and the balance is used for cultivated crops; 300 acres of wheat and 170 acres of oats are being sown this year, and 200 acres are intended for fallow. In addition, 124 acres have been sown with fodder crops, namely, 35 acres with lucerne, 20 acres with barley, 14 acres with oats, 40 acres with field peas and 15 acres with Wimmera rye grass. Silage again forms the bulk of the reserves of fodder, of which there was a total quantity of 358 tons conserved in three trench silos. The silage in one pit was made from a crop of oats which was sown with a combine without any previous soil preparation; in the second pit the silage was wheaten and oaten; and the other pit contained silage, one-third of which was a mixture of oats and peas and the balance wheat and wild oats. Two stacks of oaten hay, totalling 110 tons, were well built and thatched; one was built on a straddle rendered mouse-proof by inverted petrol tins and the other was protected from damage by mice with a galvanised iron fence, the joints of which were capped. In a large galvanised iron grain silo 26½ tons of oats were safely stored. The total quantity of fodder was greatly in excess of requirements, but was lacking in fodder rich in protein, which is necessary to provide for the feeding of a balanced ration.

The third prize was won by Mr. F. B. Hinton, of Canowindra, this being his first appearance in these competitions. His property of 1,986 acres has a frontage to the Belubula River, and lucerne is grown on 506 acres of flats. In addition, 252 acres of the upland soil are sown with cereal crops, and 15 acres of barley and 15 acres of oats are sown as green fodder crops. The conserved fodders consisted of 402 tons of lucerne hay, mostly of prime quality, stored in two large hay sheds and two stacks; 555 tons of silage in three trench silos made from the first "cut" of the season from the lucerne crops, and consisting chiefly of lucerne and barley grass; 31 tons of oaten hay in two stacks, and 48 tons of grain, chiefly oats, in a galvanised iron silo, but some also stored in bags under shelter. The quantity was not quite sufficient according to the theoretical carrying capacity of the property, but the quality generally was excellent.

Some Points in Filling the Pit.

In addition to the advantages mentioned in the introductory paragraph, there are others which contribute to the growing popularity of silage. Crops that are unsuitable for hay-making are capable of being conserved as silage, and weedy crops can be made into very good silage. Moreover, it is possible to ensile crops when conditions would not permit the satisfactory curing of hay. Thus volunteer growths of wild oats, self-sown wheat, and herbage can be conserved as silage at very small expense, as

was done by the winner of this year's championship, Mr. K. Gault. It is also the practice of Mr. F. B. Hinton, the third-prize winner, to conserve as silage the first cut of lucerne of the season. Silage is the best form in which to conserve this first cut, for as a rule the first growth each year contains much barley grass, which on account of its awns is not satisfactory for hay.

On inspecting some of the silage pits it was found that the silage was in excellent condition right to the top, with practically no waste, whereas in others there were several inches of the top layers of the fodder spoilt by mould. This development of mould is due to the surface fodder drying out before it is covered with earth. While it is necessary to allow a certain time for the fodder to settle before covering, the period should not be long enough for the material to become dry. If the filling of the pit is completed quickly, too long a period is required to allow the fodder to settle sufficiently before covering, and it is preferable that intervals should be allowed for settlement during filling and pressure should be applied to the fodder by driving the loaded waggons over the fodder in the pit. It is an advantage to have two pits, so that while the fodder is allowed to settle in one pit the filling of the other pit can be proceeded with. If the fodder is well compacted, and is stacked to a height above ground level equal to the depth of the pit before covering, there should be no danger of the material sinking below ground level and leaving a depression.

All the competitors except two had made provision for the storage of grain in galvanised iron silos, and this, also, is a considerable advance on previous competitions. These silos are undoubtedly the most effective means of protecting grain from the ravages of mice and rats. They were of various design; some were rectangular, but preference was given to round silos. Mr. Unger, of Parkes, had an excellent arrangement of three circular galvanised silos 25 feet in diameter and 8 feet high, set side by side on a cement foundation and each with a low conical top; on the higher side a ramp was constructed on which the waggons loaded with bags of grain were drawn, and from which the grain could be filled into the silos with a minimum of labour and very little loss of time.

More attention should be given to the conservation of lucerne hay. Cereal silage and cereal hay are deficient in protein and require to be combined with a fodder which is rich in protein for the purpose of feeding a balanced ration, and no fodder "fills the bill" so well in these districts as lucerne hay. Only four competitors had lucerne hay conserved, but as all but two now have lucerne crops established on their farms, this deficiency may be expected to be remedied in future competitions.

Better cultural methods and better varieties have been responsible for a gradual increase in average wheat yields in New South Wales. For the period 1892 to 1901 the average yield per acre was 10.02 bushels, for the period 1902-11 it increased to 11.04 bushels, and to 11.62 bushels for 1912-21, while for the period 1921-33 it was 12.44 bushels.

Varieties of Maize.

Recommendations for Different Districts.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

THE following varieties of maize are recommended by the Department of Agriculture for sowing in the various maize-growing districts of New South Wales. Growers are reminded to make early arrangements for seed supplies, and if in doubt as to which variety to sow to communicate with the Department or get into touch with the local agricultural instructor.

APPROXIMATE ORDER OF MATURITY OF VARIETIES RECOMMENDED.

Very Early.—Early Morn, Golden Glow.

Early.—Wellingrove, Duncan, Golden Superb, Kennedy, Iowa Silvermine, Auburn Vale, Funk's Yellow Dent, Iowa Goldmine, Large Goldmine, Funk's Ninety-day.

Midseason.—Boone County White, Hickory King, Leaming, Golden Nugget, Early Clarence, Golden Beauty, Murrumbidgee White, Manning Silvermine, Giant White.

Late.—Yellow Hogan, Fitzroy, Large Red Hogan, Ulmarra Whitecap, Pride of Hawkesbury.

VARIETIES RECOMMENDED FOR GRAIN.

Upper North Coast.

(a) *Tweed River.*

Early Crop.—Leaming, Iowa Silvermine.
Main Crop.—Fitzroy, Ulmarra Whitecap, Large Red Hogan (for early sowing only).

(b) *Lower Richmond River.*

Early Crop.—Hickory King (second-class soils only), Leaming.
Main Crop.—Golden Nugget (second-class soils only), Fitzroy.

(c) *Upper Richmond River.*

Early Crop.—Leaming.
Main Crop.—Fitzroy, Large Red Hogan, Ulmarra Whitecap.

(d) *Clarence River.*

Early Crop.—Leaming, Wellingrove.
Main Crop.—Fitzroy, Ulmarra Whitecap.
Second-class Soils.—Golden Nugget, Hickory King.

(e) *Bellinger River.*

Early Crop.—Leaming, Golden Superb, Manning Silvermine.
Main Crop.—Fitzroy, Ulmarra Whitecap.

North Coast Tableland.

Dorrigo and Comboyne Districts.

Main Crop.—Leaming, Golden Superb.

Middle North Coast.

(*a*) *Nambucca River.*

Early Crop.—Golden Superb, Leaming, Hickory King, Manning Silvermine.

Main Crop.—Fitzroy, Yellow Hogan.

(*b*) *Lower Macleay River.*

Early Crop.—Golden Superb.

Main Crop.—Fitzroy, Large Red Hogan, Yellow Hogan, Golden Beauty, Pride of Hawkesbury, Leaming.

(*c*) *Upper Macleay River.*

Early Crop.—Golden Superb, Funk's Yellow Dent.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan, Leaming, Golden Beauty, Hickory King, Giant White.

(*d*) *Hastings River.*

Early Crop.—Funk's Yellow Dent, Golden Superb.

Main Crop.—Fitzroy, Large Red Hogan, Golden Beauty, Golden Nugget, Leaming, Hickory King, Manning Silvermine.

(*e*) *Lower Manning River.*

Early Crop.—Funk's Yellow Dent, Golden Superb.

Main Crop.—Fitzroy, Large Red Hogan, Pride of Hawkesbury, Leaming, Golden Beauty, Manning Silvermine, Hickory King.

(*f*) *Upper Manning River.*

Early Crop.—Golden Superb, Funk's Yellow Dent.

Main Crop.—Fitzroy, Leaming, Golden Beauty, Manning Silvermine, Hickory King.

Central Coast.

(*a*) *Dungog, Gloucester.*

Early Crop.—Golden Superb.

Main Crop.—Fitzroy, Hickory King, Leaming, Manning Silvermine, Yellow Hogan.

(*b*) *Lower Hunter River.*

Early Crop.—Funk's Yellow Dent, Golden Glow.

Main Crop.—Large Red Hogan, Fitzroy, Leaming.

(*c*) *Hawkesbury River.*

Early Crop.—Golden Superb.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan, Leaming, Manning Silvermine.

(*d*) *County Cumberland.*

Early Crop.—Hickory King, Wellingrove.

Main Crop.—Fitzroy.

SOUTH COAST.

(a) Illawarra District.

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan, Boone County White.

(b) Shoalhaven River.

Early Crop.—Funk's Yellow Dent, Iowa Silvermine, Duncan.

Main Crop.—Leaming, Funk's Yellow Dent, Fitzroy, Boone County White, Hickory King.

(c) Milton District.

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Fitzroy, Large Red Hogan, Leaming.

(d) Moruya River.

Early Crop.—Funk's Yellow Dent, Early Morn.

Main Crop.—Large Red Hogan, Fitzroy.

(e) Bega and Pambula Rivers.

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Large Red Hogan, Golden Beauty, Yellow Hogan, Hickory King, Boone County White.

NORTHERN TABLELAND.

(a) Tenterfield District.

Hickory King, Wellingrove, Funk's Yellow Dent, Golden Glow, Iowa Silvermine.

(b) Glen Innes District.

Strong Soils.—Wellingrove.

Light Soils.—Wellingrove, Iowa Silvermine, Large Goldmine.

(c) Ben Lomond, Llangothlin, Guyra, and Black Mountain Districts.

Early Morn, Golden Glow.

(d) Armidale District.

Wellingrove, Large Goldmine, Golden Glow.

(e) Uralla District.

Wellingrove, Early Morn, Large Goldmine.

CENTRAL TABLELAND.

(a) Bathurst District.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine.

(b) Colder Districts.

Early Morn.

SOUTHERN TABLELAND.

Moss Vale District.

Golden Glow.

NORTH-WESTERN SLOPES.

(*a*) *Inverell District.*

Heavy Soils.—Funk's Yellow Dent, Kennedy, Funk's Ninety-day.
Light Soils.—Wellingrove, Iowa Silvermine.
Late Sowing.—Early Morn, Golden Glow.

(*b*) *Tamworth and Upper Hunter Districts.*

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

CENTRAL-WESTERN SLOPES.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.
Upland Soils.—Iowa Silvermine, Early Morn, Duncan.

SOUTH-WESTERN SLOPES.

(*a*) *Tumut River.*

Rich Alluvial Flats.—Main Crop (October sowing), Early Clarence, Murrumbidgee White; Early Crop (late sowing), Funk's Yellow Dent.
Second-class Alluvials.—Funk's Yellow Dent, Iowa Silvermine.

(*b*) *Murrumbidgee River* (*Gundagai District*).

Funk's Yellow Dent, Murrumbidgee White, Iowa Silvermine, Golden Glow.

MURRUMBIDGEE IRRIGATION AREAS.

Funk's Yellow Dent, Iowa Silvermine.

VARIETIES RECOMMENDED FOR GREEN FODDER.

COASTAL DISTRICTS.

Early Varieties.—Leaming, Iowa Silvermine.
Late Varieties.—Fitzroy, Pride of Hawkesbury, Ulmarra Whitecap.

TABLELAND DISTRICTS.

For Warmer Districts.—Fitzroy.
For Cooler Districts.—Leaming, Iowa Silvermine.
For Coldest Districts.—Wellingrove.

WESTERN SLOPES AND MURRUMBIDGEE IRRIGATION AREAS.

Fitzroy.

Debates have become widely adopted in the activities of Agricultural Bureau branches. The following subjects for debates are taken from the programme of a branch in the north-western wheat area, and should serve either as suggestions or subjects for debates in other branches:—(1) Ploughing is necessary for wheat production in this district. (2) Horses are preferable to tractors for the wheat-farmer. (3) Rolling of cultivated land is beneficial. (4) Rabbits are an asset to the State.

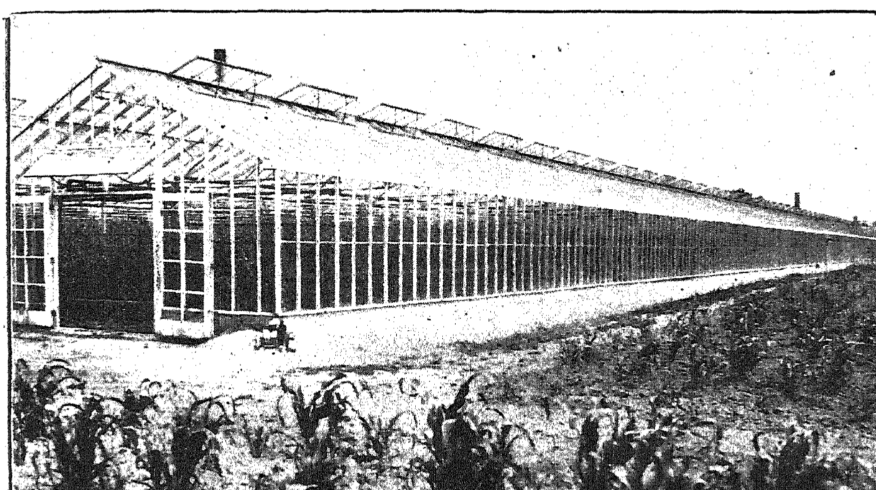
The Vegetable Growing Industry.

What Other Countries Can Teach Us.

JOHN DOUGLASS, Senior Agricultural Instructor.

Mr. Douglass, the author of this article, recently visited U.S.A., Canada, Mexico, England and the Continent in search of new ideas on every side of the vegetable growing industry. And he got them—new crops, new cultural practices, new harvesting, packing, transport and marketing methods, and new seed raising ideas. Some of the so-called progressive methods of America, England and elsewhere are, of course, not applicable to Australian conditions, but much that Mr. Douglass saw and was shown whilst abroad will greatly benefit the vegetable industry in this country, and these will be passed on to growers in a series of articles in this *Gazette*.

My recent investigations in the intensively-farmed areas of North America and England have more than ever convinced me of the great possibilities in the vegetable-growing industry in this country. Even with our many shortcomings—shortcomings which I feel confident can be overcome by application of the knowledge I gained whilst on my trip abroad—the



Will This Type of Glasshouse Become Popular Here?
The author predicts it will. His reasons will be given in a subsequent article in this *Gazette*.

vegetable-growing industry in New South Wales at present is of considerable importance. Unfortunately, it has always been looked upon more or less as a side line, or, at most, as one of the minor industries, whereas in point of value of production and importations (which should and could be catered for by local growers) it rivals in importance even the fruit-growing industry. According to the Government Statistician, the value

of vegetables produced in New South Wales in 1931-32 on commercial areas was over £667,000. Add to this the value of overseas imports of vegetables (£53,000) and £75,000 worth of imported seed (often of doubtful quality), plus the value of about 1,000,000 bags and cases of vegetables imported into the State each year, and (just for measure) add to this already huge total the value of vegetables produced in backyards and on other non-commercial areas, and you will find that the potential value of the industry, even in its present unorganised and backward condition, lies in the vicinity of £1,000,000 per year. But by following the more progressive methods of other countries—methods which I intend to outline in a series of articles in this *Gazette*—the potentialities mentioned can be increased immensely.

Firstly, Let Us Increase Consumption.

The overseas vegetable growers certainly have a considerably bigger population to cater for, but then there are proportionately more growers, so that the incentive for them to do things on more progressive lines than in this country must lie in some other direction. It lies mainly in the fact that each of their consumers has been taught to "eat more vegetables."

I found the American grower in particular more commercially minded than the Australian. The former, prior to launching out in any industry, ascertained for certain what the consumer wanted. And when he did produce his article he still further "tickled the palate" of his consumer by marketing it in the most attractive manner and in the best possible condition. In short, he first assured himself that there was a market before he produced, and then he made sure of holding that market by the attractive get-up and quality of his produce. And that is why U.S.A., with its 120 millions of people, is such a great vegetable consuming country. Vegetables rather than meats (as in this country) are usually given pride of place on the menu. Being an Australian, this was, at first glance, somewhat strange to me, but after having tasted their vegetable dishes it became an easy matter to put a finger on the reason why Australians are among the poorest vegetable eaters in the world; it is because they so rarely taste the best classes of vegetables.

Growers Must Cater for the Consumer.

The Australian consumer has never been catered for. What vegetable grower in the country ever gives a moment's consideration to the likes and dislikes of his customers? I'm afraid many of them forget they grow for consumers at all; they only seem to be interested in one person, and that is their agent. The average vegetable grower sows the variety that will give—or which he thinks will give—the biggest yield under his particular conditions, trusting always, I take it, that the consumer will eventually acquire a taste for it. Quantity—and very seldom quality—seems to be his aim.

As evidence that things are as I say, it is only necessary to point to the many unsuitable varieties that are marketed from every vegetable-growing district of the State; or to note the present necessity to import certain vegetables (celery, for instance) from other States; or to go to your next local show and see the weird and wonderful display of all types of vegetables. Even look through seedsmen's catalogues and note the numerous and oftentimes useless varieties listed under almost every crop. The seedsman is not always to blame; it is his business to satisfy the demands of his customers, and experience has taught him that customers demand all sorts —good, bad, and indifferent.

A Valley of Peas in the State of Washington ,U.S.A.

Some of Our Best Paying Lines are Imported.

Better quality vegetables will very largely tend to increase consumption. A quality product advertises itself, sells at an enhanced price, and gives the consumer that satisfaction which ensures "repeat" orders. We grow few high-class vegetables in this State, and what we do grow often reaches the market in a condition which does not do it justice.

The loss from growing unsuitable varieties in New South Wales alone must run into thousands of pounds annually. We only have to examine the vegetable products imported to see that they all belong to the most payable of the vegetable crops, while their very high standard as regards quality still further emphasises the relatively neglected position of the vegetable-growing industry in this State. Imported celery, Brussels sprouts, glass-house tomatoes, beans, peas, rhubarb, asparagus, and other valuable crops are all able to compete successfully with the locally produced article, whereas local growers should have a distinct advantage over outsiders, with Sydney, the greatest Australian market, situated right in the centre of our

intense agricultural areas. That tomatoes, as an example, can be profitably imported from Fiji and as far afield as Western Australia does not reflect great credit on local growers. Again, no other country in the world presents such a splendid opening for mushroom growing, and there is no reason why New South Wales imports the major portion of her dry beans. Apart from the vegetables that are imported from other States, I gathered during my trip abroad useful information concerning vegetable crops that are not yet grown (or not extensively grown) in this country, and which I am certain would find a place on our markets.

Imperative to Grow Our Own Seeds.

In other countries where vegetable-growing is such a flourishing industry they go to no end of trouble to ensure a supply of the very highest grade of seed; in some centres they even employ special plant breeders. I found

Growing Cabbages for Seed in U.S.A.

it most difficult to convince prominent agricultural authorities overseas that a country so ideally situated as Australia depended upon foreign plant breeders and seedsmen for most of its vegetable seed supply. Apart from the possibility of introducing diseases and pests, the varieties bred for the particular conditions of U.S.A. or England are unlikely to be ideal for our climate, and an even worse feature is that it is not always the best grade of seed that is exported.

So it boils down to this. Increased consumption of vegetables is necessary to ensure the profitableness of the industry, and the best way to increase consumption is to grow a better quality product, which cannot be done with surety unless we produce our own seed. In connection with this last-mentioned phase, I am convinced that seed production in Australia could be made a thriving and profitable industry.

A Good Article is Worth Advertising.

Another feature of the vegetable-growing industry in America with which I was forcibly struck was the nation-wide advertising campaigns that were often undertaken in the interests of some particular product. In America the primary product is treated in the same way as the manufactured article. Its good points are placed prominently before the public, and faith is kept with the public by producing and marketing an attractively got-up product possessing all the good points claimed for it by the advertisements. Many Australian growers are already convinced that good cultural methods and big yields are only half the battle; the growers in other countries could tell them that quality and better business methods on the marketing side comprise the other half.

NOTE.—Whilst the author of the foregoing article brought back with him seeds of quite a number of new and improved varieties of vegetable crops, growers will realise that, apart from the wisdom of withholding the distribution of such seeds until they have been thoroughly tried out under local conditions, present supplies are totally inadequate to allow of any distribution whatever to growers.

There are Good and Poor Strains of White Clover.

WHITE clover is an outstandingly valuable pasture plant in temperate districts of good rainfall, says Mr. William Davies, of Aberystwyth Plant Breeding Station, Wales, in his report on Australia's dairy pastures. In respect of commercial seed, strain is most important. White clover seed harvested, for example, from the old pastures of Britain, usually gives rise to plants which are altogether different from, and of greater economic value than, strains from the continent of Europe. Under British conditions indigenous wild white clover has long been known to be much superior to the majority of European strains.

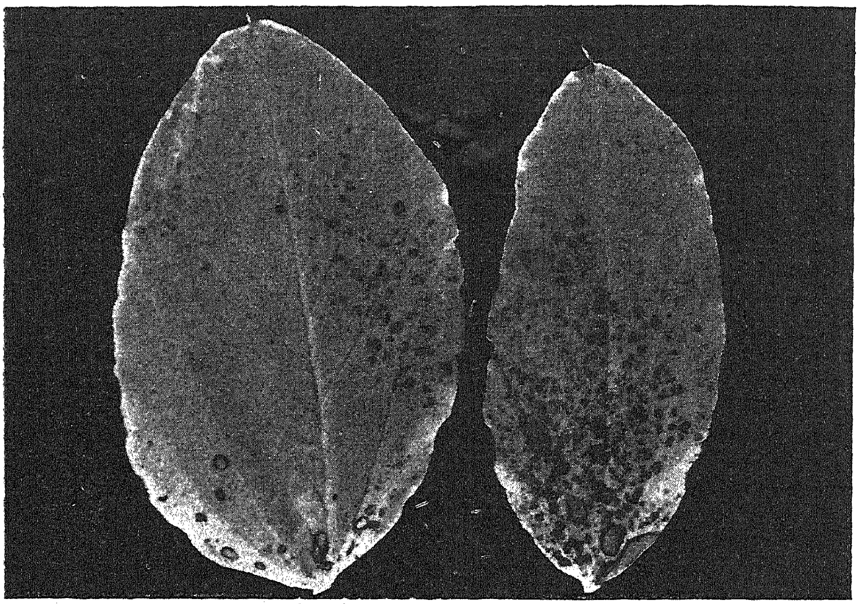
Work in New Zealand has shown that old pasture strains of white clover in the Dominion are likely to be very valuable. The best of these are very persistent and produce a dense mat of herbage. In New Zealand the best of the local strains appear to be more productive during the early years after sowing, and have larger leaves than the best of the English strains. In the course of visits to the several States of Australia, a type of white clover showing close affinity to the New Zealand large-leaved strain has been noted. This is particularly common throughout the Victorian irrigation areas, and is also to be found in certain areas of Tasmania and Western Australia, in South Australia under irrigation, and on the coast of New South Wales. A closely related form is found in many of the coastal river flats in the last-mentioned State, and also in the Nerang district of south-eastern Queensland. On the other hand, the form of white clover found in some of the old pastures on the Tasman Peninsula in Tasmania suggests close affinity to the English wild white type. In all cases these white clovers are held in high local esteem. These observations are made in order to indicate that particularly useful strains of white clover are likely to be found in certain districts of Australia. There is room for investigating these as well as for testing the value of strains whose performance overseas is already known.

Chocolate Spot of Broad Beans.

C. J. MAGEE, M.Sc., B.Sc.Agr., Plant Pathologist.

THE intensely-coloured, circular to sub-circular, red to reddish-brown spots that are to be observed on the foliage in most crops of broad beans have often been thought to be symptoms of an infectious disease.

An investigation has recently been conducted on the cause of the spots. They appear to be identical with the spots described in England as symptoms of the chocolate spot disease which has been attributed to a bacterium. All efforts here to isolate a pathogenic organism have been unsuccessful.



Chocolate Spot of Broad Beans

It has been found that typical spots could be produced experimentally by infesting plants with aphids. It was observed that where colonies of *Aphis rumicis* were established on plants droplets of honeydew excreted by the aphids collected on the leaves and dried, to form glistening smears. Spots typical of those seen in the field developed beneath these smears after about two days. The conclusion has been reached that the spots are not symptoms of an infectious disease, as was formerly thought to be the case.

The presence of the chocolate spots, apart from injuries associated with aphis-infestation, apparently has little effect on the vitality of the plant. The prominent appearance of the spots, however, is likely to be confusing, and in the past has lead to injuries resulting from root-rots and other causes being attributed to the "chocolate spot disease."

Details of experimental work on this disease will appear in a "Science Bulletin" shortly to be issued by the Department.

Potato Crop Competitions, 1932-33.

SOUTHERN CHAMPIONSHIP AND DISTRICT RESULTS.

A. J. PINN, H.D.A., Special Agricultural Instructor.

The object of conducting crop-growing competitions is to discover and give publicity to the cultural methods that produce the best crops.

The chief lessons to be learned from the comments of Mr. Pinn on this season's potato competitions in the south are that it certainly pays to treat selected seed during the winter with corrosive sublimate, and that it is a waste of land to plant less than twenty-eight rows of potatoes to the chain.

Championship competitions were also conducted this year in the Western and New England districts, and reports of these will appear in subsequent issues.

POTATO crop competitions were conducted in five localities in the Southern District in 1932-33—an increase of one compared with last season, the new area being Wingello. There were 162 original entries in these local competitions, which represented an increase of twenty on the previous year, but before harvesting a number of plots were withdrawn, chiefly owing to unfavourable weather conditions. The number of entries submitted by each locality for final inspection was as follows:—Berrima, 9 entries; Taralga, 26; Crookwell, 37; Batlow, 23; Wingello, 5; total, 100 entries.

A Hot and Dry Summer Favoured Moth Infestation and Reduced Yields.

The season was not altogether favourable, as, following good rains in January, very dry weather accompanied by hot winds during February had an adverse effect on the crops, and favoured the development of potato moth, which was responsible for reduction of yield on soils which were of an open nature. It was noticeable that where ploughing and planting had been shallow or the crops were not hilled and in those cases where second growth of tubers had occurred and the extension of growth was near the surface, greater damage had resulted from the moth grub. Frosts in January and February were also responsible for loss. In calculating the yields all grub-infested tubers were eliminated.

The R.A.S. Championship.

The winner of each local competition had the required area of 5 acres of potatoes on his farm to qualify for championship competition organised by the Royal Agricultural Society.

The points awarded in this championship competition were as follows:—

AWARDS in District Championship Competitions.

Competitor and Society.	Variety.	Yield per acre.	Points awarded.						
			Yield (5 pts. per ton).	Quality.		Freedom from disease.		Purity.	Total points.
				Appearance.	Cutting.	Tops.	Tubers.		
Maximum points ...	...	...	...	15	15	8	7	15	...
		t. cwt.							
Conlon Bros. (Berrima)	... Factor...	12 5	61¼	13½	13½	7¾	6½	15	117½
J. Howard (Taralga)...	,, ...	8 16	44	13	12¾	8	6	14¾	98½
S. Jones (Crookwell)	,, ...	6 15	33¾	13	12¾	8	6½	15	89
H. Butz (Batlow) ...	,, ...	5 18	29½	13½	12¾	7¼	6½	14¼	83¾
S. J. Cook (Wingello)	,, ...	5 4	26	13½	13	6	6¾	14¾	80

Messrs. Conlon Bros., "The Downs," Exeter, winners of the Berrima competition, have added to past years' laurels by winning the Southern District Championship for the third year in succession. In fairness to the other competitors, it should be pointed out that the crop in the Berrima district is planted earlier, and the growing season was not nearly as severe on the crop as in the main crop districts of the south. Nevertheless, the high yield obtained merited the success secured; it would be regarded as a good one in a favourable season, and this year was not altogether favourable, as during February, when the crop was maturing, very dry, hot conditions prevailed.

The soil was a free-working, medium, basalt loam, and the area had grown potatoes during the previous two years following a crop of peas. The plot area was ploughed and harrowed in June, and received two further ploughings and harrowings before planting during the last week of October. Whole, selected seed about 2 inches in size, which had been treated with corrosive sublimate solution during the winter and later spread out to green and shoot, was used. The fertiliser, applied at planting time, consisted of a mixture of 3 cwt. superphosphate and 1 cwt. sulphate of ammonia per acre. Close spacing of the rows at the rate of 34½ to the chain was adopted, but this did not prevent inter-row cultivation and hilling.

The purity standard was excellent, and the crop was practically free of virus disease.

Mr. J. Howard, Richlands, Taralga, had an excellent crop for the season. Vigour, purity, and freedom from disease were of a high standard, and had a useful rain fallen during February a very heavy yield would have been recorded. Mr. Howard also adopted close spacing between the rows, which in the case of his plot was at the rate of 40 per chain.

The area selected was new land situated on an elevated area of basalt loam. First ploughing was given on 15th August, and between then and planting the plot received one harrowing and a springtooth cultivation. Cut and whole medium-sized seed was dropped after a single-furrow plough. Fertiliser consisted of an application of 3 cwt. per acre of superphosphate. The area was harrowed after planting and again when the plants were above ground. The crop made a vigorous top growth, and the close planting of the rows did not allow of any further cultivation.

Messrs. Conlon Bros. Champion Crop.

The Berrima Competition.

The third competition carried out under the auspices of the Berrima Agricultural Society attracted twelve original entries, but two were withdrawn at first inspection and one dropped out at the final, leaving nine competitors whose plots were harvested.

The yields obtained and the general quality of the potatoes were most satisfactory. Only on one other occasion during the history of district potato crop competitions throughout this State has the winning yield been equalled.

This season was not so favourable for the Early Rose type of tubers, in which a bigger percentage of second growth occurred, which spoilt the appearance and cutting quality. The Factors throughout were an excellent

lot, being of good shape and clean skin. Very little second growth was apparent. The cutting quality varied according to the type of soil and depth of planting. Where the soil was of an open nature or where the tubers were shallow, the crispness and good colour of flesh were lacking when compared with the deeper-set crops.

Close spacing of the rows was adopted in all but two of the entries, and the results, following those of previous years, would indicate that wide spacing of rows is not advantageous and is wasteful of ground.

The points awarded the place-getters were as follows:—

AWARDS (of leading competitors only) in the Berrima District Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points awarded.						
				Yield.	Quality.		Freedom from disease.		Purity.	Total.
					Appearance.	Cutting.	Tops.	Tubers.		
			t. cwt.							
Conlon Bros. (Exeter) ...	Factor...	34½	12 5	61¼	13½	13½	7¾	6½	15	117½
Conlon Bros. (Exeter) ...	,, ...	33	11 10	57½	13¾	13½	6½	6¾	15	113
D. Fisher, jnr. (Bundanoon)	,, ...	35½	8 8	42	13½	13	4¾	6½	15	94¾

Messrs. Conlon Bros., who won this competition, are to be congratulated on their performance in winning for the third year in succession. They have also won the Royal Agricultural Society's Southern District Championship for the three years. Details of this year's winning entry are given in the championship report on page 582.

The cultivation given the entry, also by Messrs. Conlon Bros., placed second, was similar to that of the winning entry.

This competition has again demonstrated that the district is particularly well adapted to the growing of potatoes, provided good seed is used and proper cultivation methods are adopted, and that potatoes can be produced at a time of the year when the State is very largely dependent on interstate produce.

Batlow Agricultural Bureau Competition.

BATLOW branch of the Agricultural Bureau conducted its sixth potato crop competition this year. The season experienced in this district was a particularly trying one, and it says much for the district, cultivation methods adopted, and quality of seed that it was possible to obtain such yields in the face of such odds. During the growing period, December to March inclusive, only 438 points of rain fell—the highest registration being 64 points at planting time in early December. No rain was experienced during the very hot month of February.

Eighteen plots of Factor were submitted for final inspection, and these gave an average yield of 3 tons 16 cwt.

Generally speaking, the potatoes were very free from scab and grub infection and presented a good appearance. Cutting quality was satisfactory for the season experienced.

The points awarded the winners are given in detail in the following table:—

AWARDS (of Leading Competitors only) in the Batlow Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points awarded. Yield.	Quality. Appearance.	Quality. Cutting.	Freedom from disease. Tops.	Freedom from disease. Tubers.	Purity.	Total.
			t. cwt.							
			White-skinned Section.							
H. Butz ...	Factor ...	31¼	5 18	29½	13½	12¾	7¼	6½	14¼	83¾
C. Barberie ...	,, ...	38	5 11	27¾	13½	12¾	7½	5¾	15	82¼
C. Barberie ...	,, ...	36	5 1	25¼	13½	12¾	7¾	5¾	14¾	79¾
			Red-skinned Section.							
J. Bryant ...	Satisfaction ...	29	2 7	11¾	14½	12	6	6¾	14¼	65¼
J. E. Dodds ...	Early Manistee	30	2 10	12½	14¼	14	1	6¾	14¼	62¾
E. Skerry ...	Satisfaction ...	24	3 4	16	14¼	12	0½	6¾	13	62½

First prize was secured by Mr. H. Butz for his hillside plot on basalt soil. The first ploughing was given the second week of October and the plot was immediately rolled and harrowed. Planting took place on 8th December, 4 to 6 oz. potatoes being cut into sets. The seed was selected and was spread out on the shed floor to green in early October. The fertiliser applied in the furrow at planting at the rate of 5 cwt. per acre consisted of a mixture of two parts superphosphate, one part sulphate of ammonia and one part blood and bone. The area was harrowed after planting and was intercultivated in January. Rows were spaced a little in excess of 31 to the chain.

Mr. C. Barberie gave his plot its first ploughing on 3rd September and followed this up with a harrowing with a clod crushing harrow on 27th September; the plot was then tine harrowed 24th October, spade harrowed 4th November and again tine harrowed on 25th November. Planting with whole seed 1½ to 4 oz. in weight was carried out on 6th December. Seed was obtained from selected plants and was spread out to green in spring. Fertiliser consisted of a mixture of five parts superphosphate and one part

of sulphate of ammonia applied at the rate of 3 cwt. per acre. The area was harrowed immediately after planting and also when the plants appeared and when 4 inches high.

Only four plots were submitted to final judging in the red-skinned section. The results throughout were very poor and indicate that the coloured-skinned varieties are not as hardy as Factor.

Taralga Competition.

Of the original twenty-nine entries in the seventh field potato competition conducted by the Taralga Agricultural Society, three were withdrawn from final judging.

The points awarded the winners are shown in the following table:—

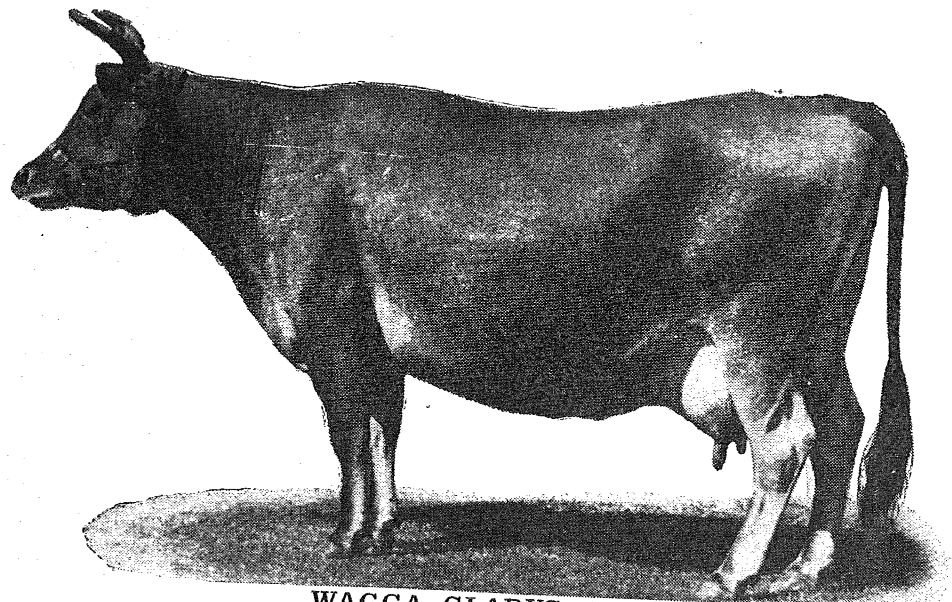
Awards (of Leading Competitors only) in the Taralga Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points awarded.						
				Yield.	Quality.		Freedom from disease.		Purity.	Total.
					Appearance.	Cutting.	Tops.	Tubers.		
			t. c.							
J. Howard	Factor...	40	8 16	44	13	12¾	8	6	14¾	98½
J. O'Brien and R. O'Connor	,, ...	31½	8 3	40¾	13½	12¾	7¾	6	15	95¾
D. Wright	,, ...	35½	7 15	38¾	12¾	12½	6	7	15	92

Mr. James Howard, of "Rose Hill," Richlands, won first prize. Details of his entry are given in the championship report on page 582, his crop gaining second place in the Royal Agricultural Society's competition.

Messrs. J. O'Brien and R. O'Connor secured second prize with a plot on new land of basalt formation. It was first ploughed on 3rd September, and between then and planting on 10th November the area was harrowed twice, ploughed and harrowed. Whole, medium-size seed was planted, and the fertiliser applied was 360 lb. superphosphate per acre, half the amount being broadcast before planting and the balance applied at planting.

Third place was secured by Mr. D. Wright, who is a consistent place-getter in these competitions. This entry showed practically no grub infestation, and the small amount of throw-out would be satisfactory for a normal year. The land was first ploughed on 21st November. Seed was mostly whole, ranging in size from 2 to 4 oz., and 3 cwt. superphosphate was applied in the furrow at planting. The after-cultivation consisted of one harrowing.



WAGGA GLADYS (7778).

The following are the Herd-testing Records of some of the Cows in Departmental Herds:—

Jersey Cow: WAGGA GLADYS (7778). This cow holds a world's record for butter production for the Jersey breed—22,847 lb. milk, 1,517 lb. commercial butter in 365 days. Awarded Champion Ribbon, Peter's Prize, R. A. Show, 1928. *Guernsey Cow:* WOLLONGBAR PARSON'S RED ROSE 20th (730). Holds a world's record for butter production for the Guernsey breed—17,252.5 lb. milk, 1,302.62 lb. commercial butter in 365 days. *Ayrshire Cow:* MISS DOT OF GLEN INNES (3760)—19,562.5 lb. milk, 1,088.64 lb. commercial butter in 365 days.

The Department has for sale young bulls from tested dams of the following breeds:—

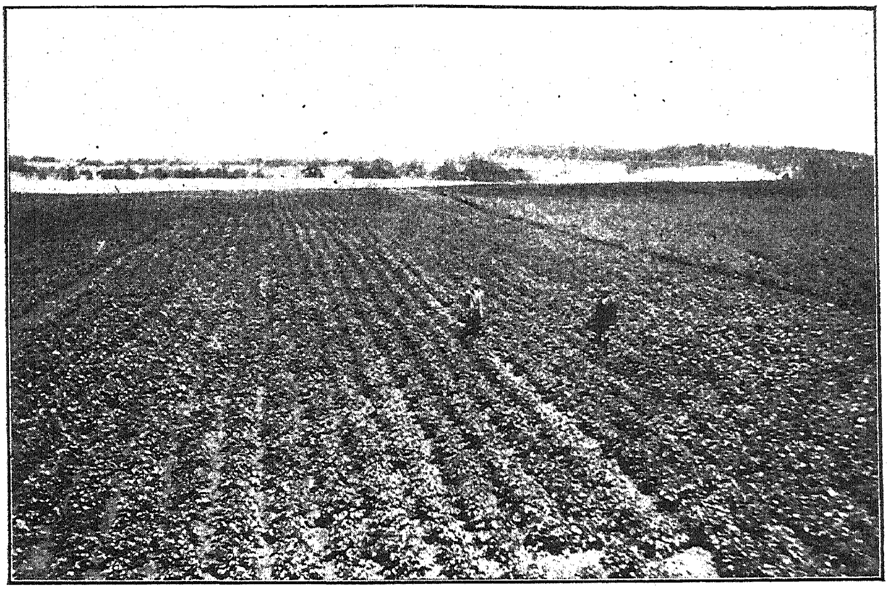
MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

For further particulars apply to—The UNDER SECRETARY, Department of Agriculture, SYDNEY.

Close Planting for High Yields.

The average yield of all plots in this competition was 4 tons 16 cwt., which is most satisfactory considering the season experienced.

Past years' results have indicated that wide planting cannot compare with close planting for high yields. In the winning plot the spacing of the rows was 40 to the chain, which is too close to allow of any inter-row cultivation. Mr. Dave Wright's two plots were spaced 35½ and 25¾ rows per chain respectively. The conditions of planting were similar in every respect, and the close-planted plot gave a higher yield by 1 ton 9 cwt. than the wide-planted plot. This is particularly interesting, as one would have



Crop in the Taralga District.

expected that in a dry summer the extra width of the rows would have helped the crop more. It would appear that planting less than 28 to the chain is a waste of land and entails extra work in the preparation of the land.

In practically all plots the shape of the tubers was very good, but in several areas where the ground was consolidated by flooding during the January storms the tubers were more flattened and irregular. Scab was not very prevalent, and most crops produced very clean tubers. Owing to the relatively dry conditions which prevailed in the autumn there will be little adhering earth, and the samples, on the whole, are of excellent appearance.

Cutting quality was very good, and most of the samples were of good texture, with little water core. There was a slight variation in colour, the light loam samples not being as white as those from the heavier red soils. All plots were of the Factor variety.

Wingello Agricultural Bureau Competition.

For the first potato crop competition conducted by the Wingello branch of the Agricultural Bureau there were ten original entries, but, chiefly as the result of the dry conditions in February and the heavy infestation of potato moth, only five were submitted for final judging.

The details of the points awarded the winners are set out in the following table:—

Awards (of Leading Competitors only) in the Wingello Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points awarded.						
				Yield.	Quality.		Freedom from disease.		Purity.	Total.
					Appearance.	Cutting.	Tops.	Tubers.		
			t. c.							
S. J. Cook (Penrose) ...	Factor...	26¼	5 4	26	13½	13	6	6¾	14¾	80
R. E. Moore (Wingello)	,, ...	34	4 14	23½	14	12	5½	6½	15	76½
A. Burnie (Wingello) ...	,, ...	26	4 14	23½	14	12	4½	6½	15	75½

Mr. S. J. Cook, who won first prize, planted a fairly large area this season, and taking into consideration the fact that the soil is not naturally as well suited to potatoes as some of the district red soils he is to be congratulated on his success. The soil, which is a light loam, was new land the previous season, and after growing a crop of beans was ploughed for potatoes in June. Apart from a harrowing, no further cultural treatment was given until the potatoes were planted after the plough in mid-October. Seed was purchased from the Taralga district and before planting was partly cut. Fertiliser consisting of a mixture of three parts superphosphate and one part sulphate of ammonia was sown in the drill by hand at the rate of 3¼ cwt. per acre. The cultivation after planting consisted of a harrowing, and later the crop was hand chipped and once inter-cultivated.

Comment on the Entries.

The cutting quality was not altogether satisfactory, as some brown fleck was noticeable. This may have been brought about by the hot soil due to February weather conditions. The appearance of the tubers was very good, particularly those from the red soil areas.

There was a big range in the distance apart of the rows—from 34 to 21½ rows to the chain. Whilst I do not suggest that very close planting be adopted, I think that competitors should aim at a minimum of 28 rows per chain. The plots of Messrs. Moore and Burnie were planted alongside one another. It will be noted that one was planted with rows relatively close, and the other somewhat wide, and that the yields were similar. In the

case of the wider-planted plot of Mr. Burnie, the crop received an inter-cultivation which threw up a little more earth covering over the tubers. This resulted in a crop from which less was discarded on account of grub infestation than from the closer-planted plot which was not cultivated. Had the season been more favourable or if a slight hilling had been given the closer-planted plot, it would have undoubtedly have produced the heaviest yield of sound potatoes.

Competitors have benefited by their experience this year, and if the competition is to be continued will no doubt pay greater attention to some of the details which prevent point deductions in their crops. The rogueing of strangers and virus plants before first judging should in particular receive greater attention.

Crookwell Competition.

In the sixth potato crop competition conducted by the Crookwell A.P. and H. Society there were many withdrawals after the first inspection by competitors with more than one entry, and for the final inspection thirty-seven plots were submitted by twenty-eight competitors.

Entries were received from a wide circle of localities, which included Roslyn, Willigum, Cottawalla, Third Creek Road, Kialla, Bannister, Gurrundah, Gullen, Glen Erin, Redground, and Brooklands.

The points awarded the place-getters are given in the following table:—

Awards (of Leading Competitors only) in the Crookwell Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points awarded. Yield.	Quality. Appearance.	Quality. Cutting.	Freedom from disease. Tops.	Freedom from disease. Tubers.	Purity.	Total.
			t. c.							
S. Jones (Bannister) ...	Factor...	27¼	6 15	33¾	13	12¾	8	6½	15	89
D. Harries „ ...	„ ...	28	6 8	32	13½	12¾	7	6½	15	86¾
A. Gorman „ ...	„ ...	27½	6 3	30¾	13½	13	7	6¾	15	86

The Winning Crops.

Mr. S. Jones won this competition with an entry grown on an area of medium loam which had not been cropped for many years. The plot was ploughed in the fourth week in August and harrowed, and was harrowed again before planting in the third week of November. The seed used was cut, medium-sized table potatoes which had been selected and stored in a long narrow "pit" lightly covered with straw. The seed was dipped in corrosive sublimate during the winter. Depth of planting was 5 inches and

superphosphate was applied in the furrows by a distributor attached to the plough at the rate of 1 bag (186 lb. approx.) per acre. The after-cultivation consisted of harrowing immediately after planting, when the plants were showing through the ground and again about two weeks later.

Mr. D. Harries gained second place. His area, which previously grew potatoes in 1929, was first ploughed in mid-August, and between then and planting on 26th November two harrowings were given. The seed was large, and was selected in the field at digging. It was dipped in August and cut before planting. The fertiliser used consisted of 250 lb. of superphosphate and 80 lb. of sulphate of ammonia per acre; this was drilled in before planting. After planting two harrowings were given and the area was inter-row cultivated once.

Mr. A. E. Gorman occupied third place. This season an area of loamy land which had been used for grazing during the past eight years was selected. This area was ploughed on 5th August, and during the intervening period up to planting on 15th November three harrowings were given. Selected seed of a size ranging from 2½ to 8 oz., the larger-sized tubers being cut before planting, was used. This was stored in a shed, and as in the case of the other two successful plots was dipped in corrosive sublimate. The fertiliser used consisted of 3 cwt. per acre of superphosphate distributed along the furrow.

Notes on the Plots.

The thirty-seven plots gave an average yield of 4 tons 7 cwt. per acre, which is remarkably high in view of the season experienced. Yields ranged from 1 ton 8 cwt. to 6 tons 15 cwt.; there were five plots with a yield of between 2 tons and 3 tons, nine between 3 and 4 tons, nine between 4 and 5 tons, nine btween 5 and 6 tons and four of 6 tons and over. All competitors grew the Factor variety in the competition plots.

The appearance of the tubers was for the most part excellent, but in some cases, due to a check in growth, there was some second growth, and in several areas there were some ill-shaped tubers due to the consolidation of the land.

Many of the competitors dipped their seed in corrosive sublimate solution as a preventive of scab, and the treatment appears to have been very effective in reducing the amount of infection. In quite a number of cases where seed was not treated there were many "scabby" tubers which showed infection either in the form of scabbed areas or small black lumps, which are the resting stage of the fungus. In each case tubers were not so free of adhering soil. Apart from the loss due to rejection on account of scabby potatoes, dipping appears to be worth while owing to the amount of time gained in grading the cleaner skinned tubers which appear to be general in crops where seed is treated.

The cutting quality, on the whole, was satisfactory in view of the season experienced.

Investigations on the Green Vegetable Bug (*Nezara viridula* Linn).

E. H. ZECK, Assistant Entomologist.

THE green vegetable bug was first recorded as a pest in New South Wales by Froggatt ([1]) in September, 1916, under the title of "tomato and bean bug." It had been observed, however, upon tomato plants, in the neighbourhood of Sydney about five years previously, but its range beyond the county of Cumberland was not then known.

As this introduced cosmopolitan bug has proved an increasingly serious pest in vegetable gardens, and is occurring in citrus orchards, laboratory and field tests with various chemical substances for control of the bug and also a close study of the life history and bionomics have been undertaken. A progress report upon the work is now given.

Distribution.

The range of the green vegetable bug as a pest, in New South Wales, is now known to be from Mullumbimby in the north to Wollongong in the south, and as far west as Gilgandra, an area of approximately 50,000 square miles (see Fig. 1). How far it may extend beyond this area without occurring in pest numbers is not at present known.

There is no record of its occurrence in Victoria and no record of its appearance as a pest in South Australia has been found. It is known to be a serious pest in Queensland, and has been recorded as a pest in Western Australia (Newman[2]), where it was first noticed around the port of Bunbury in 1920.

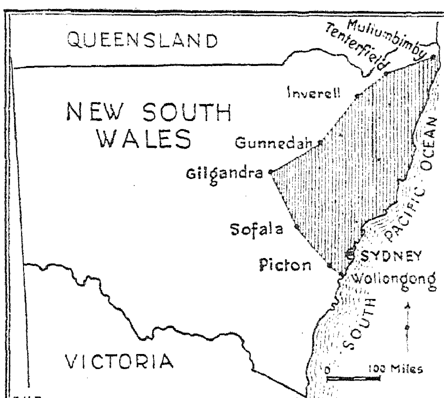


Fig. 1.—Map Showing Distribution of the Green Vegetable Bug as a pest in N.S.W.

Economic Importance.

Both nymphal and adult bugs feed by piercing the tissues with the needle-like setae enclosed in the beak or rostrum, and sucking up the sap from the host plants. Although all parts of the plant may be attacked, the most noticeable damage is caused to the young shoots or more delicate portions. Where bean plants are attacked the young bean pods are preferred as food, and owing to the injury caused by the bugs puncturing and sucking the sap from them, they become shrivelled and distorted, and well-developed beans may become pale-coloured, dry and blotched in appearance. When tomatoes are attacked the fruits become mottled and discoloured.

So far, in New South Wales, the green vegetable bug has been mainly a pest of beans and tomatoes, but has, at times, caused considerable damage to other crops. It has been observed feeding upon very young oranges, but has not yet occurred in sufficient numbers on citrus to cause noticeable damage.

Food Plants.

The food plants of this bug, so far observed, in New South Wales are beans, buttercups, cauliflowers, clover, cosmos, dock, grapes, maize, melons, oranges, passion fruit, pittosporum, potatoes, pumpkins, spinach, squashes, tomatoes.

Field Notes.

Although large numbers of the adult bugs may be present upon plants in the garden they are not readily seen, as their green colour harmonises so well with that of the foliage.

When the infested plants are disturbed, the bugs either drop to the ground or arrest their fall by clinging to the lower portions of the plant with which they come into contact, and from there either fly to surrounding plants or climb actively to the upper foliage of their hosts again.

The bugs have been observed mating in the field early in September, and adult green forms have also been observed feeding on orange buds during the same month.

Egg-laying by overwintering females commences about the middle of September, and is continued by successive generations until about the end of April, four generations having been bred in the laboratory.

During the season, some of the adult bugs become dull brown or purplish in colour, and may be seen feeding in company with green individuals. Brown hibernating forms have been taken at Ryde during June, sheltering under the bark of eucalypts.

The adult brown forms are more numerous during the cooler months, but nevertheless some adult individuals retain their green colouration throughout the winter months.

The eggs are usually laid in compact clusters, and are placed in regular parallel rows, firmly glued together, and to the surface upon which they rest. When first laid they are pale yellowish, but as the embryo bugs develop, the eggs become pinkish and gradually darken, until just before hatching, when they become reddish-brown in colour.

When ready to emerge from the egg, the young bug pushes off the circular cap or lid on the top, with a special process or egg-burster, and crawls out of the shell, which then resembles a small glassy cup. The young bugs are at first gregarious, and remain clustered together, usually in close proximity to the empty egg shells, for the first day or two.

Egg-laying and Incubation.

In experiments carried out to ascertain the number of egg clusters laid by individual females, it was found that one female laid as many as four clusters. The first cluster containing 51, the second 60, the third 67, and the fourth 49 eggs, making a total of 227 eggs. The periods elapsing during the

deposition of egg clusters were: Between first and second clusters, 10 days; between second and third, 8 days; and between third and fourth, 34 days. The first eggs of the season were deposited on 19th September by females which had overwintered in the laboratory, and the last eggs deposited were by bugs of the third generation on 28th April. The number of eggs recorded in various clusters varied from 41 to 85, and of twenty-five batches counted the average number laid per female was 57 per cluster.

The shortest period of time elapsing after reaching the adult stage and egg-laying was 39 days, and the longest 81 days.

The incubation period of the eggs varied from 5 to 8 days, but in one instance the period occupied 15 days. The average incubation period occupied 6½ days.

Period of Development.

The periods occupied in development from egg to adult are indicated below.

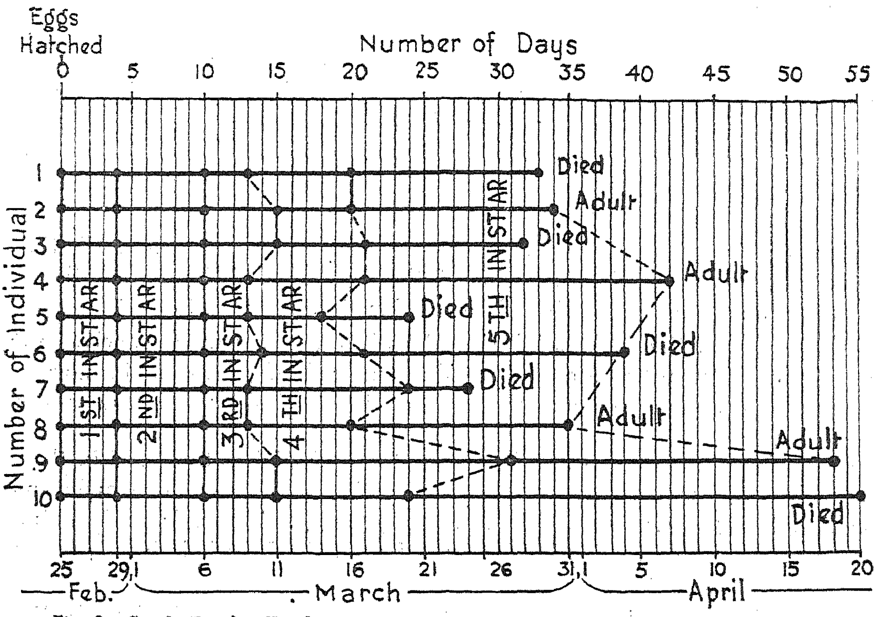


Fig. 2.—Graph Showing Number of Days Between Moults, and Length of Time Occupied From Egg to Adult.

In one experiment, a batch of eggs, taken on a bean leaf in the field, was used, and on hatching, individual bugs were selected and placed in separate glass tubes covered at each end with muslin. Observations were made daily and the bugs fed with pieces of bean pods; each exuvia (skin) was removed when cast. Of ten bugs used, only four reached the adult stage; the remainder died after attaining their fifth instar.

No variation occurred in the individual times required for their development until the third stage was reached. The shortest time occupied in attaining the adult stage after hatching from the egg was 34 days; the longest period 53 days.

The graph shown indicates the various periods in the above records. It is necessary to state, however, that in further experiments, a longer period was occupied from egg hatching to adult, viz., 63 days. Food and weather conditions are important factors in determining the period of development.

Longevity of Adults.

In order to demonstrate whether the bugs would survive under severe weather conditions, field experiments were carried out at Ryde, with adult bugs of known age. Some of the bugs used were developed in the laboratory; others were reared from fifth stage nymphs which were taken in the field feeding upon the lower branches of cosmos plants.

Well-grown bean plants were covered with one-tenth inch mesh wire gauze cages, measuring 2 x 2 x 2 feet. The cages containing some twenty adult bugs in all were in an exposed position and were not covered at any time. Seed beans were planted in the soil from time to time to ensure a food supply of growing plants for the bugs.

During the last week of June heavy frosts occurred which completely destroyed the foliage of the beans growing within the cages, while lantana, paddy's lucerne (*Sida rhombifolia*) and various garden plants near by were also severely damaged by the frosts. The frosts, however, had no apparent effect upon the bugs. One batch of bugs had been liberated on 2nd May, and another on 25th May.

Two of the females survived until 20th October, and one until 19th November, having lived for a period of 178 days and 208 days, respectively. Only one male survived until 19th November, having lived for 185 days.

While most of the bugs died during the winter, a percentage survived for periods of six months or more, and this survival of adults is the normal method of overwintering and survival of the species through the winter months.

Longevity experiments were also conducted in the laboratory, and in these glass chimneys were used, into each of which was liberated one male and one female bug taken in the field on 25th February. The ends of the chimneys were covered with hessian, and the bugs fed with whole bean pods at intervals as required.

Three of the bugs lived for over 200 days; one male survived until 21st October, and another until 29th November, these two having lived in the laboratory for 239 days and 278 days, respectively.

One female survived until 31st October, having lived for 249 days.

In these experiments no egg clusters were deposited in the field, and none after the end of April in the laboratory.

It is evident from the above tests that while considerable mortality occurs during the winter months, individuals are able to survive as adults, even under adverse conditions, for very long periods.

All the bugs in these experiments retained their normal green colour till death.

(*To be concluded.*)

Breeding Wheat for Improved Quality.

H. WENHOLZ, B.Sc. Agr., Director of Plant Breeding.

IN normal years, Australia exports over 100,000,000 bushels of wheat and flour, or more than two-thirds of her total production. If we are to maintain this outlet for our surplus production, some regard must be paid to the opinions of buyers, millers, bakers, etc., in those countries which import Australian wheat, and even to the opinions of prospective purchasers in other countries as to the quality requirements of wheat and flour according to its different uses.

What has already been attempted in this regard and the present wheat-breeding policy of New South Wales to cater for these requirements are detailed in this article.

Farrer First Bred for Quality.

THE history of wheat breeding in Australia shows that Farrer aimed at improving the quality of wheat, and that he at first produced wheats of high baking strength such as Cedar, Comeback, Jonathan, Bobs, etc. These wheats did not, however, extend greatly into commercial cultivation because of their relative unproductiveness in comparison with Federation. It was found that without an incentive in the form of a sufficient premium as compensation for their lower yields, farmers would not grow these high quality wheats. Plant breeders were therefore content to breed wheats of about the same quality as Federation, and which yielded well and were therefore most profitable for the farmer. Wheats such as Canberra, Waratah, Nabawa, Bobin, Free Gallipoli, Ranee, etc., were thus evolved.

These and wheats of similar quality which are most widely grown in Australia have been characterised by authorities in England as trending towards a lower baking quality, and efforts have been more recently made, in New South Wales at least, to produce commercial varieties which would be an improvement on these in baking quality. This has now been partly achieved in New South Wales in the varieties Baringa and Dundee, particularly in the latter wheat. These varieties, with the South Australian variety Ford, are expected to become widely grown in New South Wales, and the quality of our wheat in this State may be expected to improve somewhat in the near future.

But in addition to the millers' requirements in Great Britain, which absorbs about one-third of our export wheat, consideration must also be given to the Eastern market, which has taken about 50 per cent. of our export wheat and flour during recent years. Here the demand is for either strong or weak wheat or flour rather than for that of an intermediate character.

On account of these changes in the world's wheat markets and also because of changes which have taken place in the baking industry, attention must now be given in Australia to the breeding, production, and marketing of

both strong and weak flour wheats. The intermediate character of Australian wheat is caused partly by the growing of weak-flour varieties in dry districts, and by the f.a.q. system of marketing, which mixes the varieties and wheats from different districts. The aim of the breeder should be to associate high flour strength wheats of early maturity with the drier districts where their good baking quality will be accentuated, and to breed soft wheats of late maturity for the cooler districts where they will produce a very soft or weak flour which will more exactly supply the requirements of a large section of the Eastern trade and local biscuit manufacturers. The successful marketing of these wheats will depend on some system of grading.

Early Efforts in Other Countries.

Wheat breeding had been proceeding for many years in most countries before any attention was given to the question of improving the baking quality.

Early efforts in breeding for improved quality in U.S.A. and Canada were based on testing the gluten content of flour or the protein content of wheat, and attempts were made to show that these characters were related to the baking quality of the wheat. The superior quality of the Fife variety in Canada came under notice towards the end of last century. This variety came to Canada from a Scottish farmer named Fife, who had accidentally included some Russian wheat in a sample which he sent from Scotland. This Fife wheat of Russian origin was eventually to lay the foundation of Marquis (bred by Saunders) and other Canadian wheats which have a world-wide reputation for high flour strength or baking quality.

The Red Fife wheat was also introduced into England from Canada and served as the basis of an attempt to improve the quality of commercial varieties of English wheat by breeding. Early in the present century, Sir R. H. Biffen, of the Plant Breeding Institute, Cambridge, was associated with Sir A. E. Humphries, of the Home-grown Wheat Committee of the National Association of British and Irish Millers, in improving and testing the baking quality of English wheat. Yeoman I and Yeoman II wheats are the results of these efforts to improve the baking quality of wheat in England.

In India, Howard was responsible for improving the baking quality of Indian wheats by breeding. Pusa 4 is the best known Indian variety and it is of excellent baking quality.

Early Improvement in Australia.

In 1886, when Farrer undertook the task of improving Australian wheat, the wheat belt was mostly confined to the cooler tablelands and immediately adjacent slopes. Moreover, the varieties grown were mostly the so-called purple straw wheats which had been originally brought from England by the early colonists and had, through long continued culture, become

acclimatised to some extent in Australia. These varieties were all of late maturing habit and of an inherently soft grain, which characteristic was maintained by the climate in which the wheat was grown.

Farrer saw early that the extension of the wheat belt into drier districts depended on the production of earlier-maturing varieties, but at the same time he considered that there was a definite need for improvement in the flour strength or baking quality of Australian wheat.

He began by introducing the Fife wheat from Canada, and the early maturing drought-resistant wheats from India. Neither of these was suited for direct culture in Australia, and Farrer conceived the idea of crossing them to secure the combination of earliness, drought resistance and high quality. Cedar, Comeback, Jonathan, and Bobs were the chief varieties produced as the result of this mating. These varieties, particularly the first two, were of high flour strength but they were not very productive. Farrer then crossed the Fife-Indian wheats with the existing productive Australian purple straw varieties, and at once achieved a remarkable success. As the outcome of this crossing, the varieties Federation, Major, Bunyip, Florence, Firbank, Warren, etc., were produced. These wheats combined productiveness and suitability to dry districts, and they rapidly extended the wheat belt into drier districts in Australia. The gluten content of Australian wheat was raised to well over 10 per cent., which satisfied immediate export requirements, and considerably improved the selling value of Australian wheat in the world's markets. Local millers now also found that the public taste was satisfied with bread made solely from Farrer wheats, hard wheat being previously imported from Canada for blending with the soft Australian wheat to make a more palatable loaf.

Farrer's method in breeding for quality was to use a biting or chewing test (such as was used by Saunders in Canada and Biffen in England) on small quantities of grain such as single plant selections, and when strains of his crossbreds became nearly fixed, they were submitted to the Chemist's Branch of the Department of Agriculture of New South Wales for a milling test as well as for the determination of the gluten content of the flour and its capacity for water absorption. These were the best known methods available at the time for the determination of flour strength. Farrer may have concluded that productiveness combined with a satisfactory gluten content was the more immediate requirement of Australian wheat and that he could not combine yield with very high quality, or he may not have appreciated fully the fact that the climate was exerting a considerable influence on gluten content which was masking the inherent quality of the variety, for the fact remains that Farrer did not produce any variety of wheat (with the exception of Florence) of inherently good quality which remained in commercial cultivation. At least, Farrer's most popular wheats, such as Federation, etc., are still of inherently weak flour-strength or gluten quality when compared with Canadian wheat and with his earlier productions such as Cedar, Comeback, etc. It is thought that the improvement in quality effected by Farrer in Australian wheat was mainly due to the natural increase in gluten content brought about by the extension of the

wheat belt into drier districts. But Farrer's work in extending the Australian wheat belt into these districts must not be one whit belittled, for that work has been worth millions of pounds sterling to Australia.

Present Basis of Breeding for Improved Quality.

The task of breeding for improved quality in wheat is not a simple one. Every country has its own problems in wheat breeding, having to develop wheats with certain characteristics of maturity, disease resistance, straw strength, grain holding capacity, etc., and these characters, together with yield, must be maintained or improved, in addition to devoting attention to improvement in grain quality.

The technique of breeding involves the selection of a large number of individual plants in the early generations of a cross, and some reliable estimate of the grain quality must be made at this stage. Although the appearance or texture of the grain has been relied upon in the past in the selection of individual plants, it has been shown that this character is not thoroughly reliable as a guide to gluten quality.

Biffen in England and Saunders in Canada conducted many investigations to determine whether quality of grain or baking strength is an inherited character, and, while they differed in their views, it was finally agreed that baking strength is a complex or composite quality which is inherited, but that environment also has a large influence in determining the quality of the grain.

It is now known that flour strength or baking quality is chiefly determined by the quantity and quality of gluten in the grain. The quantity of gluten is known to be considerably influenced by climate as well as by the variety of wheat, but it is thought that the quality of gluten is more largely if not mostly an inherent character, which is not influenced to any great extent by environment.

Until recently the only valuable means available to wheat breeders of estimating the quality of the grain of individual plant selections was the determination of the protein or gluten content. Although some good results have been achieved by this means, it is now realised that it is the estimation of both the quantity and quality of gluten or of the quality of the gluten alone in the grain which is the character of importance to the breeder in selection.

It is only just recently that simple and reliable methods for the determination of the quality of the gluten in a small sample of grain have been evolved, namely, by the Pelshenke and Cutler-Worzella methods. These tests are now being utilised by wheat breeders in New South Wales for estimation of the baking quality of grain of single plant selections in the early generations of crossbred wheat. They have already been found to be of very great assistance in the determination of gluten quality and relative flour strength.

At a later stage, when the strains of a crossbred become fixed and a larger quantity of uniform grain is available and before a new variety is distributed, milling and baking tests are undertaken to give more complete data on quality.

Choice of Parents in Breeding for Strength.

The first essential in the programme of breeding for improved flour strength or baking quality is to determine these qualities of the present commercial varieties, and also of introduced varieties which are considered to be of high quality.

In New South Wales, Pelshenke dough tests have been made by the Chemist's Branch of the Department of all commercial varieties grown in this State, and by testing these varieties comparatively when grown on the same farm under similar conditions, and by repeating these tests with the same varieties from different farms, it has been possible to get a very accurate knowledge of the inherent strength of the variety and an accurate estimate of its value as a parent in breeding. This test is being extended to promising new varieties and to introduced varieties which are thought to be or which appear to be of high quality. The very best varieties for possible use as parents in breeding for high quality or for improved quality are thus indicated.

The Pelshenke dough tests so far conducted have shown that of the varieties at present in commercial cultivation, Pusa 4 is definitely of inherently high flour strength and that Florence, Duchess and Cadia are at least superior in gluten quality to Hard Federation, which is regarded as superior to the general run of popular varieties such as Nabawa, Waratah, Yandilla King, Turvey, Canberra, Gallipoli, etc., which are of low flour strength or gluten quality.

Until gluten quality tests have been made with some of the introduced wheats of high quality, Cedar, Comeback, Pusa 4, Florence, Duchess and Cadia are indicated as better parents than Hard Federation and also better than Baringa and Gullen, which are of excellent horny appearance and texture and which have been shown by these dough tests not to be of high gluten quality. This is an error into which we have fallen, and which has been revealed by the Pelshenke test.

Baking tests have been made also with promising new wheats such as Bobin, Baringa, Ford, Canimbla, and Dundee, which are likely to extend their areas in the near future. Broadly speaking, these tests have shown that Dundee, Ford, and Canimbla are superior in baking quality to the present popular varieties, and that Bobin and Baringa are at least not of lower baking quality than the present popular commercially grown varieties Nabawa, Waratah and Federation.

Climate in Relation to Breeding for Quality.

In New South Wales, the wheat breeding work of the Department of Agriculture is conducted at several experiment farms which are generally typical of the wheat belt of the State.

It has been shown that a long favourable growing period is generally accompanied by comparatively high yield and low protein content of the grain. But grain of the best baking quality is generally of comparatively high protein content. As a general rule, wheats of late maturity are grown

in the tableland districts and contiguous slopes under favourable conditions for slow ripening, high yields and low protein content, while under the drier conditions farther west in New South Wales the conditions favour varieties of earlier maturity, lower yield and high protein content. There is thus a wide range of climatic conditions in the wheat belt of New South Wales, and it seems that varieties of different inherent quality should be produced according to maturity, and more or less according to the districts in which they are likely to be grown, viz., comparatively early maturing varieties of high baking quality in the earliest and driest districts, ranging to comparatively late maturing wheats of low quality (suitable for biscuit manufacture, etc.) in the coolest and most favourable tableland districts.

This is therefore the plan which is being now generally adopted in New South Wales. It is hoped to be able to so control the situation by this policy that the new early-maturing varieties of the future will, generally speaking, be of the best baking quality, that wheats of midseason maturity will show a range from moderate to good quality, and that the later maturing wheats will be of poor bread baking quality, but more suited for biscuit, cake, or pudding flour. At the present time, either early or late maturing varieties and either hot or cool districts may produce grain of weak flour strength or of moderately good quality.

In the drier western parts of the wheat belt in New South Wales the climatic conditions do not favour high yields, and varieties of early to midseason maturity are generally grown. Moreover, such wheats ripen fairly quickly, and are hard and of high protein content. Although the varieties at present grown here are not of inherently high gluten quality, millers generally seek grain from this part of the State for blending with softer wheat of low protein content to produce flour of better quality. Similar climatic conditions prevail in the drier, hotter portions of the North-western Slopes. It is these districts of New South Wales, if any, which, with the provision of varieties of inherently high quality, could produce wheat of the highest baking quality, probably equal in baking strength to Manitoba No. 1 Hard. A definite project is now in hand to endeavour to breed such wheats, preferably of early maturity, for these districts.

On the Central and South-western Slopes and Eastern Riverina a range of varieties maturing from early to late is usually grown. The conditions mostly favour higher yields and midseason- to late-maturing wheats, and the quality of grain is generally not as high (in protein and flour strength) as in the preceding district. Although it may be possible to improve the baking quality, particularly of early wheats, in this part of New South Wales (which constitutes the major proportion of the wheat belt in this State), it is doubtful whether a marked improvement in quality can be effected in the late-maturing wheats without sacrificing yields.

In the Tableland districts and cooler slopes, a relatively smaller area of wheat is grown, and late-maturing varieties are chiefly produced. It is unlikely that wheats of high baking quality and good yield will be produced under these conditions on account of the naturally low protein content

favoured by the climate. Since biscuit manufacturers, etc., who require soft wheat of low gluten content look to these districts to produce their requirements, a policy of breeding specially soft wheats suitable for these districts and for these requirements has been decided upon. In recent years there has been a tendency by plant breeders to improve the baking quality of wheats in these districts, and there is some evidence that by reversing this policy and breeding softer wheats a marked improvement in yielding capacity can be effected. This means that the millers in these districts must be prepared to look to a lower bread baking quality in the local wheat, but their requirements in this respect can easily be met by the purchase of high quality wheats from other districts. Moreover, it is anticipated that this disadvantage will be offset by a greater demand from biscuit manufacturers for the more desirable soft wheat flour for their special requirements. Farmers in these districts may expect to benefit greatly from increased yields as the result of this policy.

Our Wheat Breeding Policy.

Although Farrer never succeeded in combining high yield and high quality in any variety, and although the experience has been in many other countries that wheats of high quality frequently do not yield as well as those of lower quality, it is possible that such a combination can be effected. The local market is beginning to pay greater attention to quality, and a small premium may make up for a slight loss in yield from high quality wheats. Moreover, it seems that our chief overseas markets definitely require either higher or lower quality wheat than our present wheat of intermediate character, and the future wheat breeding policy, in New South Wales at least, will be as indicated, with the idea of catering more exactly for these requirements. Although an increased price, particularly for high quality wheat, if marketed separately, is expected or hoped for, the advantage may not, in these days of wheat surpluses, come from an increased price as much as from increased sales for Australian wheat resulting from this closer attention to our buyers' requirements as regards quality. The present demand for Australian wheat, particularly in the East, is considered to be largely due to our favourable currency, and should not beguile us into the smug satisfaction that Australian wheat is best answering our customers' requirements as to quality.

"The progress made as a result of research has contributed materially to the growing consciousness that the world can continue to increase its population at the present rate for at least another century without any risk of food shortage. The only limiting factor is a possible world deficiency of phosphates," said Lord Bledisloe in "The Cawthron (N.Z.) Lecture" for 1932.

Investigations at Yanco Rice Research Station.

RICE growing has its full share of special problems, and it was with the object of devoting to their elucidation the attention which the increasing commercial significance of the crop appeared to warrant that the Yanco Rice Research Station was established by the Department in 1928. A number of important lines of investigations have since been pursued, and in a report of the trials carried out during the 1932-33 season the Officer-in-charge of the Station, Mr. F. Matthews, presents data of considerable value. The trials covered inquiries concerning varieties, fertilisers, green manuring, weed control, time of drainage, and time, rate and depth at which to sow.

"The results of the green manure and grazing trials are especially encouraging," states the report, "and as the benefits from the grazing of legumes and ploughing in of the residue have been shown on this year's trials to be at least equal to those obtained from the ploughing in of the whole crop, it is proposed to concentrate on this part of the trial. Ploughing in of the whole crop is too expensive for the farmer to contemplate, and there is always the risk when turning in a heavy crop and following with rice before thorough decomposition has set in that a flaggy, late-maturing crop will be produced. In fact, experience this year on the area has shown that there may be no crop at all. By grazing the crop, however, and turning in the residue not later than the second week of August, no trouble of this nature will be experienced."

The results of the fertiliser trial are also a feature of special interest, and although the report emphasises the fact that they need substantiating by further tests, as it was the first year in which the trial had been carried out in a self-contained bay, the results from a mixture of 2 cwt. sulphate of ammonia and 2 cwt. superphosphate are so marked that settlers are advised to try portion of a bay with the mixture this coming season. This mixture gave a profit of £5 3s. per acre over the cost of its application; the next best fertiliser—3 cwt. blood and bone—gave a profit of £2 12s.

The report is obtainable in pamphlet form on application to either the Rice Marketing Board, Leeton, or the Department of Agriculture, Box 36A, G.P.O., Sydney.

RICE BY-PRODUCTS AND THEIR USES.

THE proportion of cleaned and polished commercial rice to paddy, ranges from one-half to two-thirds. The approximate milling out-turn of 162 lb. of paddy is—

98 lb. commercial rice.
6 lb. polish.
28 lb. bran.
30lb. hulls.

Rice bran contains a high percentage of protein, and is valuable as stock fodder, but owing to its excessive fat content it soon becomes rancid. This can be overcome by extracting the oil, which may be sold for various uses, leaving the residue for stock.

Polish is chiefly used in America as feed for dairy cows and pigs, having great value as a concentrate. Hulls are at present valueless.

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NEW SOUTH WALES.

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The following publications of the Department of Agriculture are thoroughly practical and can be confidently recommended to fruitgrowers.

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No. 82 — Olive Culture. Price, **7d.,** including postage.
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Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Sudan Grass ...	... F. and H. Owen, "Applegrove," Dun.
Potato ("Certified" and "Standard" Seed)—	
Carman	... Secretary, Potato Growers' Association, Bannister, via Goulburn.
	Secretary, Potato Growers' Association, Millthorpe.
Early Carman ...	... Secretary, Potato Growers' Association, Millthorpe.
Early Manhattan	... Secretary, Potato Growers' Association, Millthorpe.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Factor	... Secretary, Potato Growers' Association, Bannister, via Goulburn.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Batlow.
	Secretary, Potato Growers' Association, Millthorpe.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
	Secretary, Potato Growers' Association, Taralga.
Gold Coin ...	... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Late Manhattan	... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Queen of the Valley (Standard grade only.)	... Secretary, Potato Section, Rural Co-operative Society Ltd., Batlow.
Cucumber—	
Early Fortune ...	... W. Parry, Terrigal.
Crystal Apple ...	... E. F. Ritter, Wyong.
Beans—	
Tweed Wonder ...	... P. Morandini, Bunglegumbie road, Dubbo.
	W. T. Sunderland, Bunglegumbie road, Dubbo.
	E. S. Green, Wylandra Creek, Dubbo.
Onion—	
Hunter River Brown Spanish ...	... S. Redgrove, "Sandhill," Branxton.
	C. J. Rowcliff, Old Dubbo road, Dubbo.
Hunter River White Globe.	C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Improved Sunnybrook Earliana ...	... A. Sorby, Macquarie Fields.
Break-o'-Day ...	... A. Sorby, Macquarie Fields. Manager, Experiment Farm, Bathurst.
Bonny Best ...	... Manager, Experiment Farm, Bathurst. P. Morandini, Bunglegumbie road, Dubbo.
Marglobe ...	... Manager, Experiment Farm, Bathurst.
Columbia	... Manager, Experiment Farm, Bathurst.
Norton	... Manager, Experiment Farm, Bathurst.

Pea—

Greenfeast ...	... P. Morandini, Bunglegumbie road, Dubbo.

Asparagus—

Lady Washington	... Manager, Experiment Farm, Bathurst.

Melon—

Red Seeded Citron	... Principal, Hawkesbury Agricultural College, Richmond.

Squash—

Banana	... Principal, Hawkesbury Agricultural College, Richmond.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1932 budding season, trees from which should be available for planting during the 1933 planting season :—

Nurseryman.	Oranges. Washington Navel.	Oranges. Valencia.	Eureka. Lemon.	Marsh. Grape-fruit.	Total.
L. P. Rosen and Son, Carlingford...	4,000	4,000	1,000	1,000	10,000
T. Adamson, Ermington	1,500	1,500	500	250	3,750
A. T. Eyles, Rydalmere	2,000	1,000	...	...	3,000
H. J. Ferguson, Wyong	...	200	...	...	200

—C. G. Savage, Director of Fruit Culture.

Orchard Notes.

August.

C. G. SAVAGE and H. BROADFOOT.

Black Spot of Apples and Pears.

BACK spot disease was very prevalent last season, even showing up in some districts that were previously considered free from the trouble. Should the climatic conditions turn out somewhat similar this spring a recurrence of last year's trouble may be expected. Warm, moist weather in the spring favours an outbreak on the flowers and developing fruit.

Control measures consist of pruning out and burning all dead and diseased wood, and at least three sprayings as set out hereunder. If the weather conditions favour development of the disease, further applications may be combined with the first, second and third "cover" sprays for codling moth.

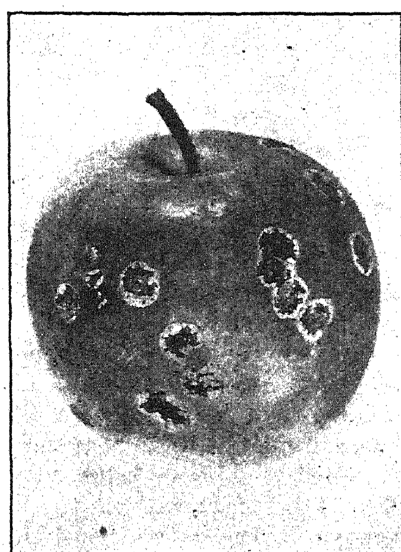
The following spray programme is recommended by the Biological Branch as being the one most likely to give complete control.

1. Spray with Bordeaux mixture (6-4-40) at "spur-burst" stage.
2. Lime-sulphur (1 in 14), 26 deg. Baumé, at "pink" stage.
3. Lime-sulphur (1 in 35), 26 deg. Baumé, at "calyx" stage, when the petals are falling, combined with arsenate of lead for codling moth.
4. Lime-sulphur (1 in 35), 26 deg. Baumé, combined with the first, second, and third "cover" sprays of arsenate of lead, if necessary.

Bordeaux mixture is liable in certain seasons to produce russeting in apples if used after the "spur-burst" stage.

It is not advisable to spray Trevitt apples or coastal-grown Williams pears with lime-sulphur after the "spur-burst" stage, while summer applications of lime-sulphur to Josephine pears will cause defoliation and dropping of the fruit. Good results have been obtained in spraying Williams pears on the coast by using Bordeaux mixture 6-4-80 in applications 1 to 4.

Lime-sulphur when combined with arsenate of lead is liable to leave a deposit on the fruit and leaves, which depreciates the market value of the former and appears to have a detrimental effect upon the tree through



Black Spot of Apple.

its action upon the latter. This objection may be overcome by the use of calcium caseinate, used in the proportion of 1 lb. of calcium caseinate to 80 gallons of spray. Calcium caseinate should be mixed by gradually blending it with small quantities of water until it is brought to the consistency of cream. This procedure will obviate difficulty in mixing and the formation of lumps. When combining the solutions, the arsenate of lead should first be placed in the vat, then the calcium caseinate and finally the lime-sulphur. It is advisable to use the spray as soon as possible after it is prepared, and care should be taken to see that it is kept thoroughly agitated when being applied.

The vigour of the trees should be maintained by the systematic use of fertilisers wherever necessary.

The Value of Windbreaks.

The advantages derived from shelter belts (windbreaks) where orchards are exposed to strong winds are not always fully realised, though more are being planted each year, writes Mr. W. W. Cooke, Senior Fruit Instructor at Goulburn. Not only is the loss from windfalls very great in orchards exposed to strong winds, but the growth and general health of the trees is adversely affected. It is not uncommon under such conditions to find the bulk of the crop of fruit carried on the sheltered side of the trees, on which side the wood growth also is stronger. Fear is often entertained that the trees adjacent to the windbreak will be robbed of plant-food and moisture, but this need not be the case, as is evidenced by the fact that these trees are sometimes the best in the orchard.

What variety of tree to plant as a windbreak requires careful consideration, as the trees chosen must fulfil certain requirements. They must make fairly rapid growth and reach a height and produce foliage of sufficient density to serve the desired purpose. The object of a windbreak is not absolutely to block the wind, as if this were done the wind passing over the top of the break would tend at once to drop or dip and strike the trees two or three rows back in the orchard. What is required is a break that will sufficiently slow down the speed of the wind that passes through it as to render it harmless. Another important requirement is that the trees of which it is formed shall not be subject to attack by scale or other pests to which fruit trees are subject. The cost of the young trees also should not be too high. Probably *Pinus insignis* fulfils these requirements better than any other tree.

The windbreak should not be planted too close to the orchard; a distance of 30 feet or more is advisable. If sufficient land is available, a double row of trees, those in the second row being planted opposite the centres of the spaces in the first, is to be preferred to a single one. Where a double row is planted, the distance between the trees in the row can be increased. Rows 10 to 15 feet apart, with the trees 20 feet apart, will usually be found satisfactory. By keeping an open drain 5 or 6 feet from the windbreak its roots are prevented from robbing the orchard trees of plant-food and moisture.

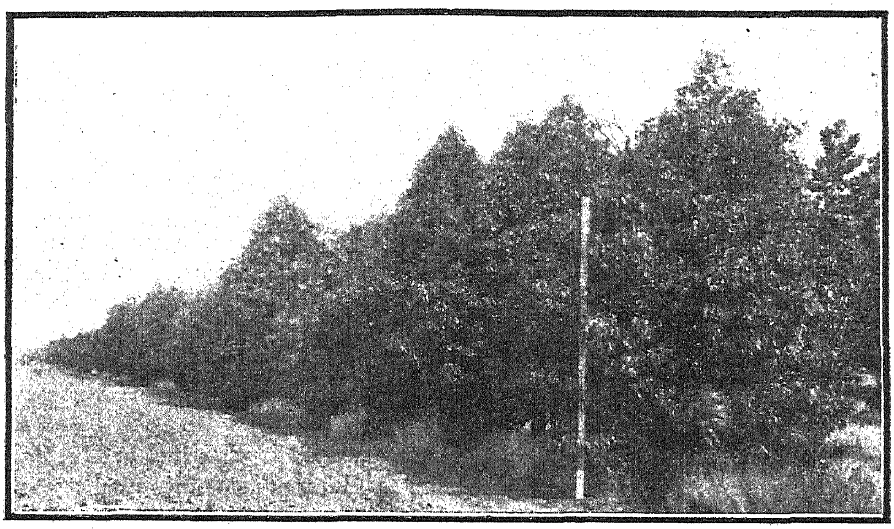
Topical Citrus Reminders.

The harvesting of the crop will be the main preoccupation of the citrus grower at present, but a few hints on planting, manuring and pruning are now seasonable.

Planting.

In certain coastal districts not subject to heavy frosts, planting in the autumn (late February and March) is very satisfactory, but with these exceptions the late winter or early spring (after frosts have ended) is the best time for this operation.

Great care should be taken that the roots of the young trees are not allowed to become dried out by exposure to the sun or air between the time they are lifted in the nursery and the time they are planted. It is a good plan to dip the roots in a puddle of clay before packing to reduce loss of moisture while in transit. Such puddled clay should be washed from the trees before planting in the orchard.



An Orchard Windbreak.

The ends of all damaged roots should be cut off smoothly, and the roots well spread in the hole and covered with loose moist soil, which should be pressed tightly around them. The trees should not be planted deeper than the depth at which they stood in the nursery, and in shallow soils where top-dressing is practised they should be planted rather shallower. When planting is completed, the ground should be ploughed up to each row of trees. If the weather turns dry after planting, the trees should be irrigated or (if irrigation be not possible) each tree should receive a couple of buckets of water. This should be applied by forming a basin round the tree, and after the water has soaked away, filling the basin in with dry soil. The

tree should be cut back on planting. Removal of the leaves is also recommended to prevent too rapid transpiration before the tree becomes re-established.

If the leaves along the stem drop, as they often do, the bark should be protected from the hot sun with hessian, paper, or other covering.

Pruning.

To balance the loss of many roots at planting, orange, lemon and mandarin trees need a reduction of their top growth. Orange trees may be cut to a straight stem or well-formed head at from 20 to 30 inches from the ground; mandarins of most varieties may be headed at from 18 to 20 inches, and lemon trees at from 20 to 24 inches. Many growths will quickly develop on such stems, but only those which emanate from the top 6 or 9 inches should be retained, the lower shoots being cut clean off or rubbed off soon after development.

In the case of oranges and mandarins little further attention is necessary, except where vigorous upright growths appear in the centre of the tree. As a rule, these should be cut cleanly out as soon as noticed. They are likely to re-appear, and, if permitted to remain, will spoil the roundish shape desired in the mature tree, and have a tendency to rob it of its vigour. The only other pruning which is desirable is the removal of any limbs which are touching the ground to a height to give a few inches of clearance, and the removal of dead wood. Any pruning that may be necessary is best performed in spring time.

In the case of mandarins, particularly of Emperor variety, pruning should be directed towards spreading the branches to counteract the upright habit of growth. In the course of time a very heavy bearing on alternate years may be observed. A light thinning of the fruiting twigs will minimise such a tendency, whilst a heavier thinning of the limbs is desirable on very mature trees growing in a shallow soil. Such prunings are not required annually, but only when it is anticipated that excessive cropping may otherwise prove improvident.

Lemon trees are rarely pruned after being headed at planting, but regular and frequent attention to pruning would result in trees being much better formed and made capable of carrying the heavy crops that frequently break them down when self-formed. Three or four vigorous, well-placed growths from the main stem should be selected as main arms on which the future framework is to be constructed. These should be cut back to a length of about 12 inches. A number of growths will occur from buds near the top of the arms, and a selection should be made of one or two which are likely to spread the growth habit, the remainder being cut off and the fresh growths that will arise from near such removals being frequently pinched back.

Manuring.

In the manuring of citrus trees nitrogen appears to be the most important constituent. The following mixture is recommended:—Sulphate of ammonia, 6 cwt.; sulphate of potash, 1½ cwt. Mix together well, and apply

¾ lb. of the mixture per tree for each year of the tree's age up to 15 lb.; thus, an eight-year-old tree will receive 6 lb.

As citrus trees are evergreen and more or less active right through the year, they should receive a dressing of the fertiliser twice a year, the first near the end of winter or early spring and the second about three months later. The applications will then be timed so that the plant-food will be available at the commencement of the two main growths in the trees.

Every opportunity should be taken to increase the organic content of the soil by the turning in of bush scrapings or similar material. The ploughing in of green manure crops, so valuable in this relation, must not now be delayed.

Other Seasonable Operations.

Pruning.

This operation may be continued during the current month, particularly in late districts. In the case of young trees the establishment of a good framework is of paramount importance; they should not be allowed to outgrow their strength or to commence cropping before the limbs can bear the weight of fruit—a slight immediate gain should not be sought at the expense of the robustness and vitality of the tree. In the case of older bearing trees the characteristics of each variety should be studied, and it should be remembered that each tree of the same variety has a sort of individuality which cannot be profitably ignored.

Control of Leaf Curl.

Spraying of peaches with lime-sulphur or Bordeaux mixture for the prevention of leaf curl should receive attention, if not already carried out, as this disease exacts a heavy toll if precautionary measures are not taken. Both of the sprays mentioned have proved efficacious in keeping leaf curl in check.

Grafting.

During this month grafting may be done in many localities, and any undesirable variety may be worked over to another kind. In grafting upon old trees numerous grafts should be inserted. This aids in the maintenance of healthy tissure round the whole limb. If only one or two grafts are placed on the outer ring of large limbs, the inside portion of the limb invariably dies back and the death of the whole limb or even of the whole tree sometimes occurs. The operation is described in detail in Farmers' Bulletin 63, "Orchard Nursery Work: Budding and Grafting," obtainable from the Department, price 10d. (postage included).

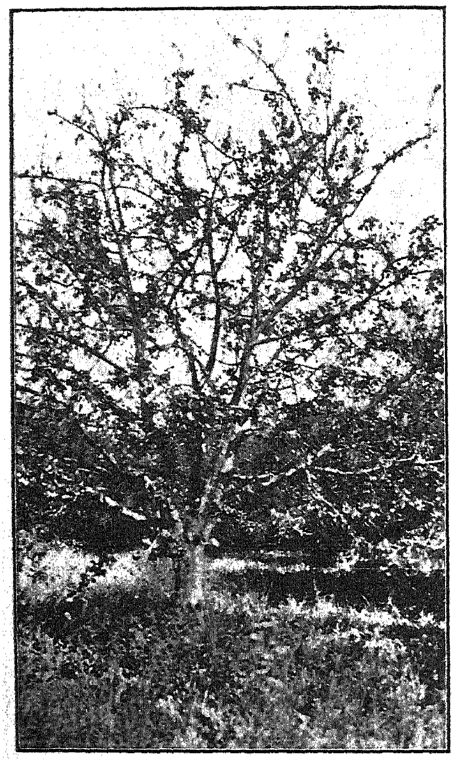
Planting of Deciduous Trees.

The planting of deciduous trees may be carried out during the present month, but earlier planting is always desirable. The tree makes root growth long before it begins to put forth new leaves and branches, and it is important that a good root system shall develop before top growth makes its

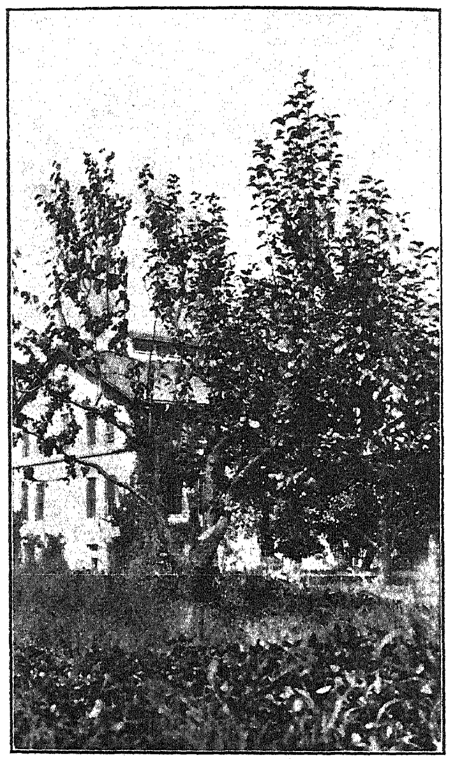
demands. When planting pome fruit, such as apples and pears, and drupe fruit, such as plums and cherries, adequate provision should be made for cross-pollination. This will frequently save disappointment in the future.

Keep Australia Free of Fire Blight.

In his recently-issued report of his investigations of the fruit industry in Canada and the United States, Mr. C. G. Savage, Director of Fruit Culture, urges that every precaution be taken to guard against the introduction of fire blight disease. The greatest danger of introducing it is by the impor-



Apple Trees Defoliated by Fire Blight Disease.



Limbs of Pear Tree Killed by Fire Blight.

tation of affected trees. The possibility of introduction of the fire blight bacillus by means of fruit appears to be very remote, according to investigators in both Canada and U.S.A.

In some countries this disease takes heavy toll of fruit each season, and especially is this the case with pear trees. Limbs (as shown in the illustration) and even whole trees may be killed out by the disease.

A limited number of copies of Mr. Savage's report is available for free distribution.—Editor.

Bunchy Top Control.

Early Identification, Eradication of Infective Aphids, and Destruction of Diseased Stools.

H. W. EASTWOOD, H.D.A., Senior Fruit Instructor.

The greater prevalence of bunchy top disease last season should act as a forceful reminder that this disease is still the most serious problem to be reckoned with in the banana-growing industry, and as it is not unlikely that in some instances last season's outbreaks may constitute a source for early infection this spring, the control measures to be adopted during the coming season should be planned well ahead in order to get control of the disease as soon as it appears.

The first essential is that every grower should be able to identify the disease in all its stages. The symptoms are quite distinct and easily recognisable, and are well described in a free pamphlet issued by the Department; or, if preferred, the local banana instructor will give a practical demonstration in identification.

Certain control measures are prescribed by regulations, but the progressive grower will go further than he is forced to do by law, and for the guidance of these men Mr. Eastwood has outlined a complete control programme in the following article.

It has been previously stated in this *Gazette* that the successful and economical control of bunchy top disease depends on four most important points: (1) Detection in its earliest stages; (2) immediate and thorough spraying of the stool to kill all aphids, which might otherwise carry the disease to healthy plants; (3) digging out of the entire stool; and (4) subsequent destruction of the stool as described later.

Extra precautions that might be employed with advantage are:—(1) After destroying the bunchy top stool spray the remains of it on the ground with pure kerosene; (2) if practicable (in most instances this cannot be done), burn the stool in the hole it was removed from; (3) spray all neighbouring stools for some distance around with a contact insecticide to kill and check the spread of aphids and so minimise the risk of further infection. Nicotine sulphate (40 per cent.) or kerosene emulsion is recommended.

Auxiliary Control Measures.

Plantation sanitation is of considerable value indirectly in bunchy top control; therefore—

1. Keep all stools free of trash, as this facilitates inspection and the detection of disease.

2. Limit the number of plants and suckers to each stool rather than allow it to become overgrown with suckers, some of which may never produce a marketable bunch.

3. Space the plants wide apart, especially on the richer soils where stool growth is vigorous.

4. Keep weed growth under control, even if only to create conditions under which inspections are more easily and comfortably performed.

Spray Diseased Stools with Power Kerosene.

For the destruction of the aphids on diseased stools power kerosene is preferable to lamp or refined kerosene, being both cheaper and more efficacious. This oil is easily applied with a compressed air pump or an atomiser. Aphids live on all parts of the plant, and are to be found around the base of the pseudo-stem at soil level, and for some distance below the surface, also on young peeper suckers just emerging from the ground. Dense colonies occur between the sheaths of the outer leaves and pseudo-stem and in the funnel leaf. Every part of the stool should therefore be sprayed thoroughly, including all suckers and peepers. To do so effectively all trash, stones and obstacles need to be removed from around the stool before spraying begins.

After applying the spray around the funnel leaf and neck of the pseudo-stem, if the aphids have congregated there in colonies, commence spraying at ground level around the base of the pseudo-stems and suckers and wet the surface soil also. Continue up the barrel of the pseudo-stem, at the same time pulling away the sheaths of the old leaves and spraying the freshly exposed surfaces. Follow this procedure right to the last leaf on the plant, making sure that all the leaves, and particularly the leaf axils and funnel leaf, get a good wetting with the spray. It is often necessary to unfurl the funnel leaf to spray the inside. After the stool has been dug out and destroyed, which should be done when spraying is completed, it is an added safeguard if the remains on the ground are again sprayed all over.

Sprays for Control of Aphids on Healthy Plants.

For the control of aphids on healthy plants, either a tobacco wash, nicotine sulphate (40 per cent.), or kerosene emulsion is a suitable spray. The addition of soap to the tobacco extract sprays to act as a spreader is essential, as it makes the solution more adhesive and penetrating, and will ensure a much more even distribution and a better "kill" of aphids. Directions for mixing these sprays are obtainable in leaflet form from the Department, Box 36A, G.P.O., Sydney. It is important that kerosene emulsion be thoroughly emulsified before use, for if there is any free oil in the spray it will burn the foliage of the banana plant.

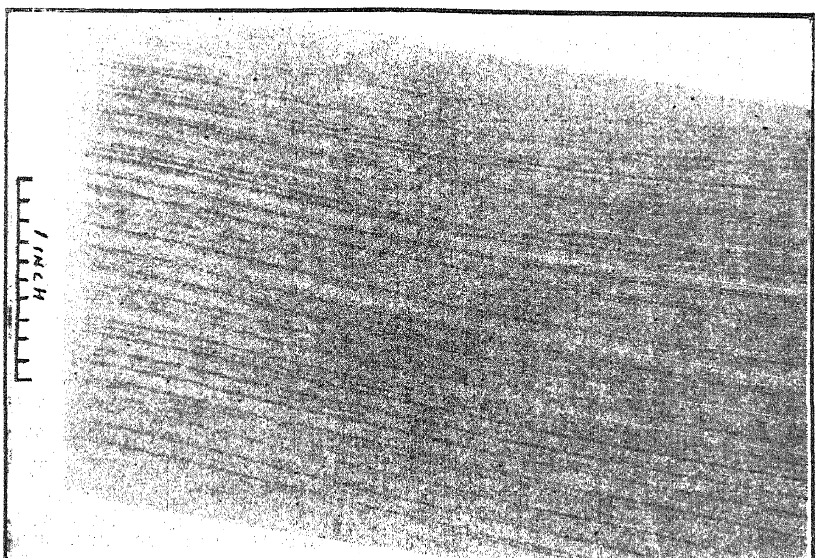
Healthy stools should be sprayed in a similar manner to that described for diseased stools, except that the plants should not be damaged by interference. Where the infestation of aphids is heavy it may be advisable to repeat the spraying to kill those missed during the first application.

When spraying, the pressure should be kept high and a fairly coarse nozzle used to ensure a drenching spray, as, being contact sprays, it is necessary to "hit" and wet the aphids to obtain a kill. Increasing the strength of the solution will not offset thoroughness of application.

It is safer when spraying at a high pressure to use a pump fitted with a gauge. The pump shoould also be fitted with an automatic "cut off" nozzle, by which the spray can be regulated to fine or coarse. In many instances also, especially when spraying well-grown plants, an extension rod 3 or 4 feet long will facilitate the application of the spray, particularly when it is necessary to reach up and spray down into the centre of the plant.

Timeliness and Thoroughness Count.

Timeliness and thoroughness are absolutely essential in the control of bunchy top disease. It is necessary to discover the disease as soon as it shows up, which means that frequent and regular inspections of all stools in a plantation must be made. A thorough spraying should then be given immediately, for it is the aphids which get away before the bunchy top is found or after imperfect treatment has spread the disease to other plants.



The First Symptoms of Bunchy Top Disease.
Portion of a leaf, showing the broken dark green streaks that are visible when held up to the light and looked at from the under-side.

Some growers contend that in spite of every precaution the disease continues to spread in their plantations. In such cases it has always been found that there is a weakness in the control measures employed. Aphids in sheltered positions on the diseased stools, such as in hidden peeper suckers, unfurled funnel leaves, old leaf sheaths, leaf axils, under fruit bracts and in the bell of the bunch, have been missed by the spray. In other cases, some growers persist in the old practice of pouring kerosene down the funnel leaf of the diseased plant. Apart from contravening the present regulations, which insist that the whole plant must be thoroughly

sprayed, this method only kills a percentage of the aphids present. Other growers, while carrying out the spraying regulations to the letter, allow the diseased plants to stand for a day or two, "to enable the kerosene to act on the plant," so they explain. This shows a lack of knowledge of the true purpose of spraying. The only reason for spraying is to kill the aphids present at the time of the application. If the plant be not destroyed immediately after spraying, any aphids missed will either leave the plant to infest other plants, or, worse still, they may multiply considerably in a few days, thus enormously increasing the danger of spreading the disease. It is also very likely that aphids from nearby stools will visit the diseased plant between time of spraying and time of destruction, and as the spray in no way destroys the disease virus in the plant, each aphid that visits the stool thus becomes a potential disease spreader.

In digging out the stools it frequently happens that parts of the corms or distant small eyes and peeper suckers are missed in the digging, and these continue to grow. As they are diseased, this is another way in which bunchy top disease may spread. Furthermore, when subsequently chopping up the plants, in many instances the corms are not sliced up into small enough pieces, and eyes or junks will continue to grow under suitable conditions, especially if they are in contact with the soil.

Prospective growers should make certain they are getting suckers from a clean source, and thereby guard against one of the two means of getting bunchy top in their plantations. It is easier to prevent its introduction in this way than to cope with it after it has developed.

From now on, be on the Lookout for Bunchy Top.

Generally the disease becomes more active with vigorous growth in the spring and through the summer and autumn months, and while it is imperative to fight this disease all the year round, the fight must be intensified during that period of the year which suits it best.

Growers would find it to their advantage if they were to keep an accurate record from year to year of what has been done in fighting this disease. The records might include the dates of outbreaks, the number of stools infected, the kind and amount of spraying materials used, and the method of application, the success achieved in preventing the further spread from separate infections, and other useful particulars. By studying these records and carefully checking them with the records of other growers it should be possible to eliminate any weaknesses in the methods employed.

In conclusion, let me issue a warning to over-optimistic and careless growers, who, perhaps through lack of experience with bunchy top, do not realise the seriousness of the disease and the damage it is capable of doing. It has been demonstrated in a practical way that it can be controlled, but the best results are possible of achievement, especially in closely-settled districts, only by the united efforts of all banana growers.

The Tung Oil Tree Does Well in Suitable Districts.

ALTHOUGH the growing of the tung oil tree (*Aleurites Fordii*) is yet only in its experimental stage in this country, and the prospective grower is warned against planting out commercial areas where there is any doubt as to the suitability of either soil or climate, it is probable that when the districts most suited to the tree have been determined, appreciable quantities of tung oil may be produced in this country.

An annual rainfall of not less than 28 or 30 inches seems to be required, heavier rainfall, of course, being preferable. A hot summer and a fairly cold winter seems to suit the tree. In China, where it thrives, although snow is often present in winter, where the tree yields best there is

Showing the Bearing Habit of the Tung Oil Tree.

generally only about 4 degrees of frost. The trees do not appear to do well where more than 12 or 13 degrees of frost occurs. On the other hand, if the winter is not sufficiently cold to give the tree a definite resting period and cause it to shed its leaves, the yield is not likely to be satisfactory.

The mature fruit reaches a diameter of from 2 to 3 inches, and resembles somewhat a small apple in shape. It may grow either singly or in clusters of two or more. Five or more seeds are generally found in each fruit surrounded by an outer husk; 340 to 350 nuts go to a bushel of 30¾ lb. Tests of seed viability have shown that seeds must be planted during the season following that in which they mature.

Tobacco Notes for August.

C. J. TREGENNA, Tobacco Expert.

WITH the tobacco sowing season here again, it is opportune to draw attention to the futility of attempting to grow tobacco on unsuitable soils. Light sandy soil and a good summer rainfall are essential to produce leaf of bright colour, good texture, and possessing that mild pleasant aroma so much in demand. Even irrigation cannot entirely take the place of rainfall, as the right conditions of humidity must be present.

Make a Succession of Sowings.

From the present time up till the first week of November is the most suitable time to sow tobacco seed. A succession of sowings at intervals of a week or ten days should be made, so as to be assured of an adequate supply of plants whenever the weather is favourable for transplanting after danger of frost is past.

The site chosen for the seed-beds should be in a position sheltered from prevailing winds, and the soil should be a well-drained, rich, sandy loam. First mark off beds 4 feet wide, then pile a quantity of timber and brushwood on the surface, and start a fire on the leeward side, the intention being to raise sufficient heat to kill insect eggs and seeds of any weeds that may be present. Rubbish of any size should be raked off, but the fine ashes should be left, as these will act as a fertiliser when worked into the bed. Then the surface should be broken to a depth of 5 or 6 inches, and worked up to as fine a tilth as possible.

If it is desired to obtain plants quickly, lightly cover the whole bed (so that it may be plainly seen) with high-grade superphosphate before sowing; about 3 or 4 lb. will be required for each 100 square feet of seed-bed. Take a rake and lightly draw it over the bed once. The seed-bed should be enclosed with a framework of wood, so that it can be roofed over with cloth.

Mix Seed with Ashes Before Sowing.

As tobacco seed is very light, the calm of the early morning will be found the best time to sow the seed. One level teaspoon of seed is sufficient for a bed 4 feet wide and 25 feet long, and should yield enough plants for one acre. To ensure even distribution, the seed should not be sown without addition to its bulk. A simple method is to use two buckets, one of which should be about one-third filled with fine ashes. Place a thin layer of ashes in the empty bucket, and sprinkle as evenly as possible a pinch of seed over it; add another layer of ashes and mix well. Repeat the process until the quantity of seed it is desired to sow is used up, together with the ashes, and then mix again with the hands. The mixture of ashes and seed should be distributed over the bed as evenly as possible; the colour will be found a guide as to evenness. The seed should not be raked in, but after sowing the bed should be gently firmed all over with a piece of flat board. Then lightly water the bed several times with a can that has a fine rose.

A Kangaroo Louse Infesting Dogs.

R. N. McCULLOCH, B.Sc., B.Sc.Agr., Assistant Entomologist.

AT a sheep station in the Gulargambone district of New South Wales in April, 1933, the writer found a dog heavily infested with biting lice, which on examination proved to be *Heterodoxus longitarsus* (Piaget), Johnston and Harrison. The infested animal, an airedale, which had been purchased in Sydney about nine months previously, had had little contact with the station sheep dogs, and as a search of the latter failed to reveal the presence of lice, it was thought that the airedale had been infested before it arrived. Later, however, in June, a heavy infestation was found on young kelpie puppies which had not left the kennel where they had been born and had not been in contact with the airedale. About 100 specimens were collected from three small pups by placing the bodies of the latter in an atmosphere containing chloroform. By the same method a few specimens, together with some dog fleas (*Ctenocephalus canis*), but no other species of lice, were obtained from an adult sheep dog.

It is a remarkable fact that this louse, belonging to a family characteristic of marsupials, has succeeded in becoming established as a permanent and vigorous canine parasite. It has not apparently hitherto been recorded on dogs in Australia, which is rather surprising, since it undoubtedly has its origin in this country, and has spread widely abroad.

On the airedale referred to above many eggs were observed attached singly to hairs of the animal's coat. From some of these, full-grown embryos, unmistakably *Heterodoxus*, were dissected out.

The writer has attempted no control measures against this insect. The owner of the dog bathed it once in "dilute, non-arsenical sheep dip." The treatment apparently failed to kill many adult parasites and eggs. It is thought that dusting with a few pinches of sodium fluoride would prove effective.

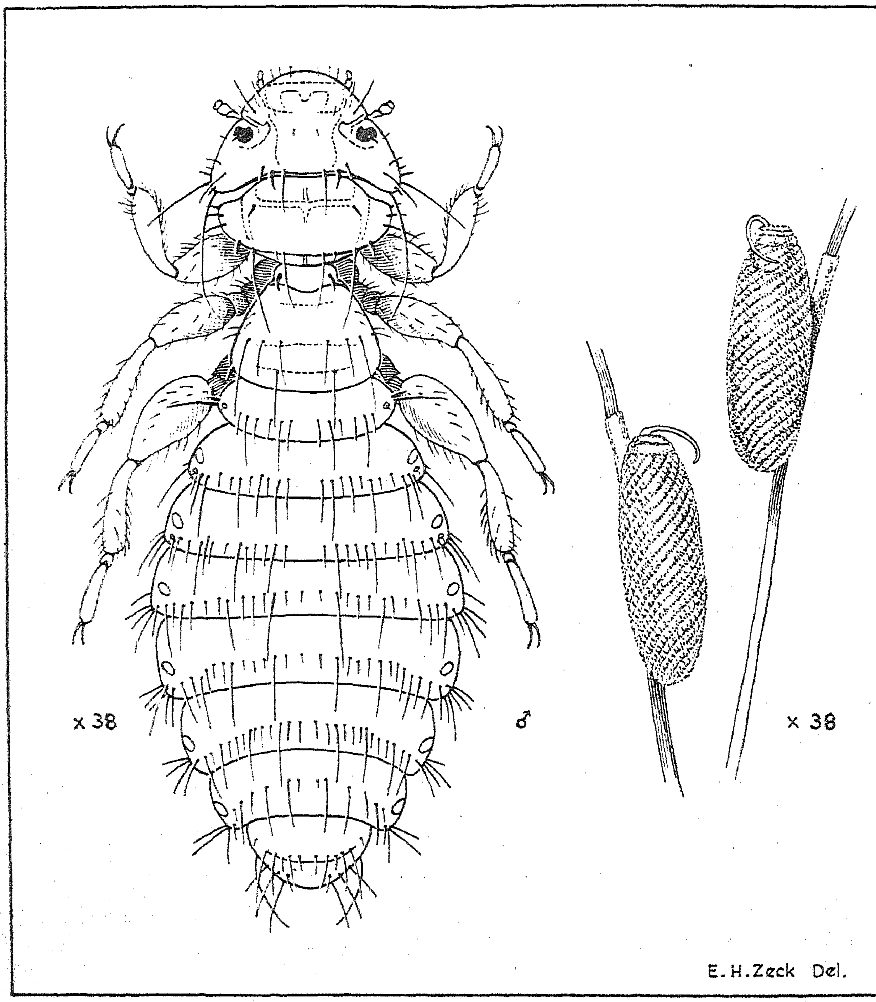
Technical Description and Other Details of *Heterodoxus longitarsus*.

Heterodoxus belongs to the family *Boopidae*, sub-family *Boopinae*, the latter group being distinguished by having four-jointed palps. It is distinguished from *Boopia* by the absence of post-ocular emarginations and the presence of two spines on the under side of the head; and from *Paraheterodoxus* by having those spines at the base of the palps and not posteriorly on the gular margin.

Johnston and Harrison (1916, p. 338) gave descriptions of all known members of the family, including a new *Heterodoxus*, *H. brevispinosus* from *Phascologale flavipes*, a pouched mouse, and added: "We are acquainted with two other new species, both from marsupials, which will be described in a later communication." The writer has been able to find no such subsequent publication.

They gave as synonyms of *H. longitarsus*:—

Menopon longitarsus, Piaget 1880, p. 504, pl. 41, fig. 7.
Menopon spiniger, Enderlein 1909, p. 80.
Menacanthus longitarsus, Neumann 1912, p. 359, fig. 5.
Menacanthus spinigerum (Enderlein) Neumann 1912, p. 364, fig. 12.
Heterodoxus macropus, Le Souef and Bullen 1902, p. 159, fig. 11.
Heterodoxus armiferus, Paine 1912, p. 362.



Adult Male and Eggs of *Heterodoxus longitarsus*.

In the same paper they recorded as hosts of *H. longitarsus* many species of kangaroos, and noted that it had been recorded from dogs in several countries and from a jackal in Africa. Commenting on this "extraordinary host distribution" they wrote: "It has led Paine (1912) to claim that

Heterodoxus is characteristic of dogs. Such is certainly not the case. It is undoubtedly a marsupial parasite, and all occurrences on carnivora must be ascribed as straggling." Hoffman (1930) reported this louse as an important dog parasite widely distributed in temperate and tropical America.

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1880. Les Pediculines. Essai Monographic Leyden.

* Not seen by the writer.

LORD BLEDISLOE'S SURVEY OF RECENT AGRICULTURAL RESEARCH.

"THE Cawthron (N.Z.) Lecture" for last year was delivered by Lord Bledisloe, Governor-General of New Zealand, the title of his address being, "A Conspectus of Recent Agricultural Research." If, as Lord Bledisloe states, the salvation of our creaky structure of civilisation lies in the amplification of science and a corresponding spread of human understanding to comprehend its truth, a perusal of his lecture (published in booklet form by Messrs. Whitcombe and Toombs, Ltd.; price 1s.) should help greatly to buttress civilisation's insecure structure.

Lord Bledisloe surveys in a very readable manner the most striking results of recent researches into most branches of agriculture and offers many suggestions concerning future work. The commercial aspect of research is also emphasised, as, after all, the ultimate justification for research is its monetary benefit to the farming community.

Its sixty-two pages are well worth reading. Our copy from the publishers.

Tanning Fur Skins.

THE "LIGHTNING PROCESS" AND THE WATTLE-BARK METHOD.

THE Department is sometimes asked for recipes for tanning fur skins, and the process first mentioned below (the "lightning process") was supplied recently to a correspondent. This process is much quicker than wattle-bark tanning, but, while quite effective, is not as good as the latter method.

The "Lightning Process."

Cut off the useless parts of the skin and then soften it by soaking, so that all flesh and fat may be scraped from the inside with a blunt knife. Soak the skin next in warm water for an hour, and during that time mix equal quantities of borax, saltpetre, and Glauber salts with enough water to make a thin paste. About half an ounce of each ingredient will give enough for a small skin, and proportionately more will be required for larger ones. When the skin has soaked in the warm water, lift it and spread it out flat, so that the paste may be applied with a brush to the inside of the skin; more paste will be required where the skin is thick than where it is thin. Double the skin together, flesh side inwards, and place it in a cool place for twenty-four hours, at the end of which time it should be washed clean and treated in the same way as before with a mixture of 1 oz. sodium carbonate (washing soda) ½ oz. borax, and 2 oz. hard white soap; these must be melted together slowly without being allowed to boil. The skin should then be folded together again and put in a warm place for twenty-four hours. After this, dissolve 4 oz. alum, 8 oz. salt and 2 oz. sodium bicarbonate (baking soda) in sufficient hot water to saturate the skin; the water used should be soft, preferably rain water. When this is cool enough not to scald the hands, the skin should be immersed and left for twelve hours; then wring it out and hang it up to dry. The soaking and drying must be repeated two or three times, till the skin is soft and pliable, after which it may be rubbed smooth with fine sand-paper and pumice-stone.

Wattle Bark Tanning.

The second method, in which wattle-bark is the tanning agent, though not so quickly accomplished, should give better results.

Collect some wattle-bark and make a strong decoction by boiling or steeping the bark in water. A bushel of crushed bark from a tannery, if one is near at hand, will be found an easy way of getting the best bark. The skin should be scraped clean on the inside, as in the "lightning process," before steeping begins. It is best to let the skin lie as flat as possible while soaking; and a large, square, zinc-lined packing-case is therefore preferable to a barrel. The skins should be completely covered by the liquid, which must either be changed once a week or boiled anew and skimmed. While the skin is out of the liquid each week it should be lightly scraped. Large skins take up to six weeks to tan well, but small skins will not require more than a month.

Dairying Notes.

AUGUST.

Sow Kikuyu Grass in the Spring.

KIKUYU is a very succulent grass, a rapid grower, will hold its own with paspalum, produces more feed than the latter during the winter months and an abundance of fodder during the spring-autumn period, and, in addition to all these good points, it is particularly suited to the coastal dairying lands.

A North Coast Kikuyu Pasture in the Middle of Winter.

Although the best time to plant Kikuyu grass is during the spring, good results may be obtained in the coastal districts by planting any time from September to March, provided the soil is moist enough to enable the plants to become well rooted. As Kikuyu grass does not set seed, it has to be propagated by means of cuttings, rooted runners, or divisions of the crown of the plant. It grows well on almost any class of land, provided the texture is loose enough to enable the runners to become well rooted. It is not wise, however, to establish Kikuyu on alluvial soil that is likely to be required later for cultivation, as eradication is difficult once the grass is firmly established. It has been grown to good advantage on soils that are subject to erosion, and it has also proved useful in choking out bracken fern in pastures.

Vaginitis is Not the Cause of Abortion.

THERE recently appeared in a country newspaper, over the name of a representative of a company handling a certain specific for the treatment of vaginitis, a statement to the effect that this disease was the cause of

sterility and abortion in cows, and an offer was made to inspect herds gratuitously and explain the disease to stockowners. While this disease does lead to temporary sterility, it is pointed out by the Chief Veterinary Surgeon of the Department that all available evidence is opposed to the theory that vaginitis is the cause of abortion, and the observations of competent and reliable investigators in Europe and Great Britain confirm this Department's viewpoint on the matter. In view of the inaccuracy, according to

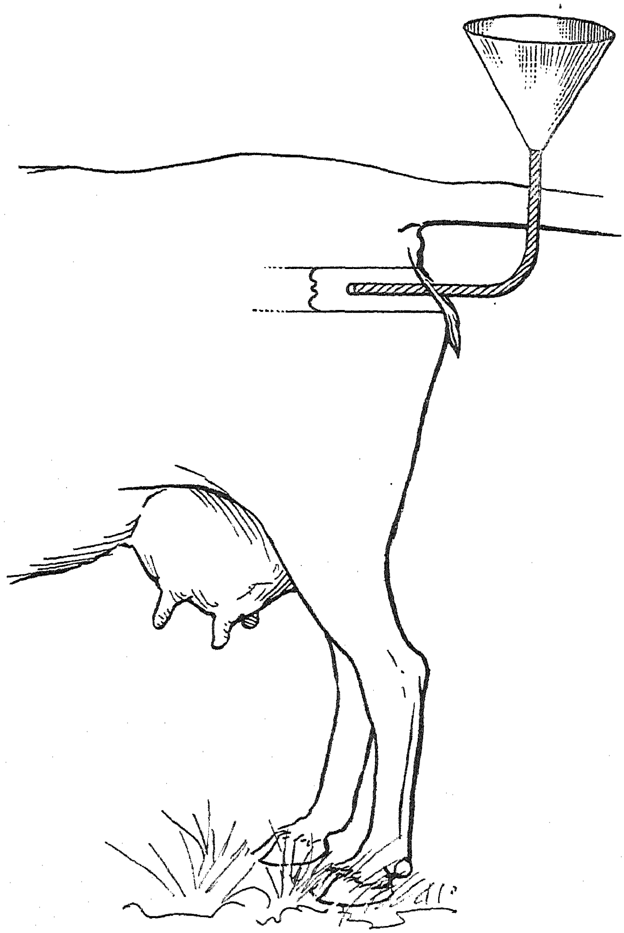


Diagram Showing the Method of Irrigating the Vagina of the Cow.

present scientific knowledge, of the opinion expressed in the notice referred to, farmers will readily be able to assess for themselves the value of any explanation that might be offered in regard to this disease, by the person concerned.

When the sterility is due to abnormal conditions of the ovary or womb, satisfactory treatment cannot be carried out by the stockowner. Frequently such cases will respond to measures which can be adopted by a veterinarian,

but such treatment requires skill and knowledge which can only be gained by technical training and experience. Certain cases of inflammation of the womb tend to recover naturally and the animals may breed later without treatment, but it must be borne in mind that all infections of the womb are serious.

Where, however, the condition is that known as "temporary sterility," and the infection is located in the vagina and mouth of the womb only, a considerable measure of success will be obtained by the adoption of routine douching. The medicament recommended is an 0.2 per cent. solution of sulphate of zinc. To prepare this solution 8 oz. of sulphate of zinc are dissolved in 1 quart of water. This makes the stock solution. One ounce of this stock solution is added to 1 gallon of water for douching a cow. Other disinfectants have been used with good results, but the sulphate of zinc solution is very effective and is easily prepared.

The course of treatment recommended is as follows:—

All cows on the farm should be treated when the system is first adopted. Treatment should be carried out irrespective of the stage of pregnancy. Provided that the solution is made up to the correct strength and care taken with the douching, no ill effect will follow. Thereafter each cow should be subjected to a further course of treatment following each calving.

The treatment consists of douching every cow each alternate day for three weeks.

In order to guard against the transference of infection from cow to cow by means of the apparatus used for douching, the tubing or nozzle should be boiled immediately before inserting it into the vagina of the cow. Where a number of cows are being treated at the same time the apparatus should be disinfected by boiling between the individual treatments.

A cheap and satisfactory method of douching cows is by means of a funnel and piece of rubber tubing (see diagram).

Rock Phosphate and Superphosphate Unsuitable as Licks.

ANOTHER point in connection with licks has recently been noted—one which is of somewhat wide application, writes Mr. Max Henry, Chief Veterinary Surgeon. When the question of providing phosphates for stock in licks was first under consideration in this State it was naturally thought that besides bonemeal such material as superphosphate and rock phosphate should be considered. There was at the time, however, evidence from South Africa and the United States that the two latter materials had an undesirable effect on the digestion of livestock, and for this and other reasons the Department consistently recommended the use of bonemeal. Recently reports have been received from the United States, Morocco, and South Africa with reference to the use of rock phosphate as a means of supplying phosphates to stock. Very undesirable results are reported from all three countries, and the consensus of opinion has been that the cause of the trouble is the fluorine content in the phosphate. Experiments in feeding fluorine salts to stock in South Africa have produced results similar to those

which follow the feeding of rock phosphate. The animals which received the fluoride showed poor appetite and lost weight and developed characteristic swellings on the bones of the legs. In the American experiments the animals developed undesirable changes in the teeth and became unthrifty. In a feeding experiment with superphosphate in South Africa, although the animals responded well in the beginning, towards the end of the experiment they began to develop symptoms not unlike those of the group receiving rock phosphate, and it was found that the superphosphate contained 1.5 per cent. of fluorine. It has been noted that the ill effects of feeding materials containing fluorine do not appear for a considerable period, but there seems to be no reason to doubt that excessive amounts of fluorine in any phosphate are likely to produce undesirable results if the material is fed for a long period.

Why High Producing Cows are Most Profitable.

THE following interesting facts and figures are taken from an Idaho (U.S.A.) University bulletin:—

Which is the Best Herd?

22 cows, each producing 200 lb. fat, returning 1,000 dollars over feed cost.

or

12 cows, each producing 300 lb. fat, returning 1,000 dollars over feed cost.

or

9 cows, each producing 400 lb. fat, returning 1,000 dollars over feed cost.

Answer.—9 cows, each producing 400 lb. fat yearly.

Why?

Each herd returns 1,000 dollars over feed cost.

But—

1. The 22-cow herd produced 800 lb. fat (22 per cent.) more than either of the other herds, which tends to build a surplus and depress prices.
2. The 22-cow herd required 38 per cent. more feed than the 12-cow herd and 58 per cent. more than the 9-cow herd.
3. The 22-cow herd required more time and labour and greater expenses in shelter and taxes than either of the other herds.
4. The 12-cow herd produced butter-fat at a feed cost 24 per cent. lower than the 22-cow herd.
5. The 9-cow herd produced butter-fat at a feed cost 32 per cent. lower than the 22-cow herd.

Sale of Stock Remedies to be Regulated.

SATISFACTION has been expressed generally among stockowners concerning the recent announcement by the Minister for Agriculture (Hon. Hugh Main, M.L.A.) that draft legislation was being prepared to regulate the sale of stock medicines, vaccines, stock licks, and patent stock foods.

Warnings to stockowners have been sounded from time to time to save them from being imposed upon by unscrupulous vendors of proprietary remedies for different stock diseases. Many of these medicines are entirely useless; they may even be harmful. In other cases, although the preparations may contain constituents beneficial for the treatment of the diseases they are claimed to cure, the prices charged are often altogether disproportionately high in comparison with actual cost. In one particular case investigated recently, a preparation selling at over £2 for a tin containing less than 1 lb. weight of the mixture was made up of ingredients that would probably cost less than 1s. per lb.

Other instances have come under notice where farmers' herds have been inspected and treatment recommended for vaginitis by persons who, it is believed, have had little or no training in connection with diseases of stock. In one case, cows were examined by means of an instrument, and it is understood that no precaution was taken to sterilise the instrument before using it on each individual animal, with the result that a grave risk was run of spreading any disease that might possibly have been present. Another objectionable practice which has been reported is that of vendors of specifics of this nature, after inspecting the stock and diagnosing the trouble according to their own viewpoint, endeavour to induce the stockowner to accept the treatment they are canvassing by forwarding the material or leaving it with the stockowner despite protests from the latter.

Before allowing persons of whom they have no knowledge to conduct examinations of their cattle, farmers should be particularly careful to satisfy themselves that these individuals possess the proper knowledge which would enable them to take precautions against the spreading of infection.

The Department's Aberdeen Angus Cattle at Trangie Show.

Against strong opposition at the recent Trangie show the Department's Aberdeen Angus cattle were very successful, taking all the prizes in the "Export Steer" classes and two championship, two reserve championship, eight first and three second prizes in other classes.

Details of the awards are as follows:—

Aberdeen Angus Stud Cattle.

Bull, milk teeth and over—1st and 2nd.

Bull, 2 teeth only—1st.

Bull, 4 teeth only—1st and Reserve Champion.

Bull, 6 teeth only—1st and Champion.

Heifer, milk teeth—1st and 2nd.

Heifer, 2 teeth—1st.

Heifer, 4 teeth—1st and Reserve Champion.

Cow, 6 teeth or older—1st, 2nd and Champion.

Export Steer Classes.

1 fat steer showing milk teeth only —1st and 2nd.

2 fat steers showing milk teeth only —1st and 2nd.

1 fat steer showing two teeth only —1st and 2nd.

2 fat steers showing two teeth only —1st.

1 fat steer showing four teeth only —1st.

2 fat steers showing four teeth only —1st.

Improving Herd Yields.

By the Application of Herd Recording Results.

F. WILKINSON, Senior Dairy Instructor, and A. W. WALKER, Dairy Instructor.

It is essential that every farmer who has submitted his herd for recording under the herd recording scheme administered by the Department of Agriculture should fully appreciate the possibilities that the scheme affords. It is considered that several failures to establish considerable increases in the herd production have been mainly due to insufficient understanding of the methods to be adopted in applying the results, and also to insufficient information having been recorded as to the breeding of the heifers that are being added to the herd from time to time.

In this article the authors indicate what records should be kept and how they can be used in conjunction with the Department's herd record sheets.

Keep a Herd Register.

It is wise, as will be made plain in this article, to record the details and the results of all the operations on the dairy farm. It is suggested that the first essential is the keeping of a permanent herd register. This will consist of a strongly-bound, small book, and all the foundation cows, *i.e.*, those in the herd at the commencement of the compilation of the herd register, should be entered and allotted a number. Any new cow or heifer added to the herd will be allotted the next consecutive number. For instance, in an initial herd of forty cows, the foundation cows will be numbered 1 to 40.

When a newly-calved heifer is added to the milking herd, she will be allotted number 41, and each subsequent addition will be allotted the next consecutive number until 999 is reached, when the numbers might be commenced again from 1.

This identification number should be indelibly marked on the cow either with a tattoo outfit or with firebrands. In the case of a tattoo, it is suggested that the number be placed in the left ear, whilst in the case of the use of firebrands, the number might be placed on the milking-side shoulder, the hair being clipped from around the part where it is intended to brand so as to ensure a clean, neat brand. Only when a cow or heifer has been added to the milking herd should the branding be carried out.

In this register should be kept particulars of the breeding of each cow entered, also any known particulars as regards the production of the dam, grand-dam, etc. The book should be large enough to enable entries to be made in it for a number of years.

The following method of ruling the leaves of the herd register is suggested:—

HERD REGISTER.

No.	Name of Cow.	Date of Birth.	Sire.	Dam.	Remarks.
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....

An Annual Register is also Necessary.

The next requirement is the compilation of an annual register, and for this purpose, a small, cheap, exercise book should be purchased. In this book will be kept a complete record of the monthly activities of each cow in the herd. The amount of milk, percentage of butter-fat, and the amount of butter-fat produced by each cow for the month, together with notes on the seasonal conditions, dates of service and by which bull served, date of calving, age of cow at the commencement of recording, sex of calf, name or number allotted to calf and details as to the final disposal of calf, *i.e.*, whether kept for the purpose of later admitting to milking herd or whether summarily disposed of, will all be recorded—on a separate page for each cow.

This book will be found to be a valuable adjunct to systematic dairying, since it will enable the farmer, at a moment's glance, to be fully aware of any particulars in regard to any cow in the herd.

This book might be entered up from month to month, a separate page being allotted to each cow, as already indicated. The ruling given on page 628 is suggested for this register.

Choose the Breeding Heifers by the Aid of the Production Records.

At the expiration of each recording year in future, a checked summary of the monthly records of each cow tested in each herd will be forwarded by the Department to each recording member, and it is on these results that herd improvement should be effected. The opinion has been frequently expressed that the object of herd recording is to eliminate the cull cows. Whilst admitting that this is the natural sequence, it is submitted that the primary object is to find out definitely which cows are the ones to rear the calves from.

ANNUAL REGISTER.

Name and Number of Cow....................

Sire .... Dam....................

Age at commencement of Test..........years, ...months.

Month.	Production Record.				Service Record.			Calf Record.			
	Milk.	Test.	Butter-fat.	Remarks, Season, etc.	Date of Service.	Served by.	Remarks.	Date of Birth.	Sex.	No.	Remarks.
19 .	lb.	Per cent.	lb.								
October											
November ...											
December ...											
19 .											
January											
February ...											
March											
April											
May											
June											
July											
August											
September ...											
Totals ...											

The first essential in herd improvement is that a bull of known production strain must be used. To make definite improvement a farmer must decide which breed is most suited to conditions existent on his particular farm, ascertain what particular lines of blood in the breed selected have definitely proved productive, and then select a bull of the breed chosen, having the desired lines of blood and that has also the necessary constitution and masculinity to enable him to pass on the characteristics for which he has been chosen.

It is then necessary to consider the cows, whose yields will be shown in the columns A, B, C, D, E, F and G of the herd summary (see page 631), or in as many of these as they qualify for. Before making a decision in regard to the cows to retain calves from, however, it will be necessary to re-group the two- and three-year-old heifers to bring their production to the one standard, *i.e.*, that of a mature cow; they cannot be expected to produce the same quantity of milk and butter-fat as a cow perhaps four or five years old. The following table shows how this is done:—

To the annual production of a—

Junior 2-year-old, add 50 per cent.
Senior 2-year-old, add 40 per cent.
Junior 3-year-old, add 30 per cent.
Senior 3-year-old, add 20 per cent.

This table has been calculated to approximate the standards set down by the Australian Registered Pure-bred Dairy Cattle Production Scheme (section I) for the ages referred to in this article.

A junior 2-year-old is an animal that is 2 years old but under 2 years 6 months on date of calving; a senior 2-year-old is one that is 2½ years old but under 3 years on date of calving. The same applies to a junior and senior 3-year-old.

The method of applying the results would be to keep all heifer calves from cows in Groups A, B, C, D and E, or in the highest groups according to the production of the member's herd. In better-class herds cows in Group F might be allowed to remain in the herd for milking purposes, but calves should not be reared from them. Should no cows attain to a higher group than Group F in a low-class herd, the best heifers from the highest-producing cows in that group must be kept for replacements. Cows in Group G should be removed from the herd when fresh stock, which have been selected from the higher-producing cows, are available to replace them. By adopting this method of replacements the farmer will be on the way to building up a profitable herd of high producing cows.

One of the principal aims of herd recording is to try and get the farmer to breed his own cows. In this way he will know the history of every cow in the herd as well as minimise disease on the farm, for "Buying cows often means buying disease and somebody's culls."

All heifer calves should be either tattooed in the right ear (for preference) or fire-branded on the small of the back with the dam's number,* so

* In the April issue, in an article by Mr. J. Scott, Senior Dairy Instructor, other systems of marking calves for identification purposes were described.

New South Wales.

Department of Agriculture, Dairy Branch.

HERD PRODUCTION IMPROVEMENT SCHEME.

Members' Herd Recording Summary.

Member's Name.................................... District ....

Season .... No. .... Sub-unit ....

HERD Average Particular	No. of Heifers or Cows.	Average Butter-fat Production.
		lb.
Cows recorded (including Sections 1, 2, and 3, and all cows recorded for one or more sub-periods)		
,, with single lactation of under six months ... ... Sections 2 and 3		
,, ,, ,, six months and over ... ... ,, ,,		
,, 3 years and over for one or more sub-periods ... ... ,, ,,		
Heifers on first calf and under 3 years for one or more sub-periods ... ... ,, ,,		

Grouping of Cows Recorded for Six Months or over, under Sections 2 and 3.

Particulars of each Cow's Production of Butter-fat.

Name and Number of Cow.	Production.							Name and Number of Cow.	Production.						
	A	B	C	D	E	F	G		A	B	C	D	E	F	G
	400 and over.	350 and over.	300 and over.	250 and over.	200 and over.	150 and over.	Under 150.		400 and over.	350 and over.	300 and over.	250 and over.	200 and over.	150 and over.	Under 150.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.		lb.	lb.	lb.	lb.	lb.	lb.	lb.
Daisy (D 10)	...	...	...	...	...	...	145								
Molly (H 52, S 2), Senior 2	...	...	...	(294)	210	...	...								
Ruby (D 16)	...	...	...	254	...	...	...								
Strawberry	...	...	...	...	...	...	135								
Mary (D 7)	...	...	...	...	240	...	...								
Nancy (H 16,S 2), Junior 2	...	...	...	(285)	...	190	...								
Topsy (D 4)	...	...	338	...	...	...	...								
May (D 52)	...	...	...	261	...	...	...								
Annette (H 7,S 1), Senior 2	...	...	...	...	(215)	154	...								
Bertha (H 4,S 1), Junior 2	...	...	...	297	...	198	...								
Lady Betty	...	...	...	...	225	...	...								
Lottie	...	...	...	...	...	...	140								
Matilda	...	...	...	...	...	172	...								
Jane (H 4, S 2), Junior 3...	...	(361)	...	278	...	...	...								

"H," "D," and "S" signify heifer, dam, and sire, respectively. Where a number is shown after dam or sire, it signifies the number allotted by the member for the dam or sire.

NOTE.—The records of all cows milked under six months have been excluded from this summary, consequently the average yield obtained from this table does not represent the herd average production for the twelve months period reviewed.

New South Wales.

Department of Agriculture, Dairy Branch.

HERD PRODUCTION IMPROVEMENT SCHEME.

Members' Herd Recording Summary.

Member's Name.. District ....

Season .... No. .... Sub-unit ....

HERD Average Particular	No. of Heifers or Cows.	Average Butter-fat Production.
		lb.
Cows recorded (including Sections 1, 2, and 3, and all cows recorded for one or more sub-periods)		
,, with single lactation of under six months ... ... Sections 2 and 3		
,, ,, ,, six months and over ... ... ,, ,,		
,, 3 years and over for one or more sub-periods ... ... ,, ,,		
Heifers on first calf and under 3 years for one or more sub-periods ... ... ,, ,,		

Grouping of Cows Recorded for Six Months or over, under Sections 2 and 3.

Particulars of each Cow's Production of Butter-fat.

Name and Number of Cow.	Production. A	B	C	D	E	F	G
	400 and over.	350 and over.	300 and over.	250 and over.	200 and over.	150 and over.	Under 150.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Daisy (D 10)	...	...	...	...	...	...	145
Molly (H 52, S 2), Senior 2	...	...	...	(294)	210	...	...
Ruby (D 16)	...	...	...	254	...	...	...
Strawberry	...	...	...	...	...	...	135
Mary (D 7)	...	...	...	...	240	...	...
Nancy (H 16, S 2), Junior 2	...	...	...	(285)	...	190	...
Topsy (D 4)	...	...	338	...	...	...	...
May (D 52)	...	...	...	261	...	...	...
Annette (H 7, S 1), Senior 2	...	...	...	...	(215)	154	...
Bertha (H 4, S 1), Junior 2	...	...	...	297	...	198	...
Lady Betty	...	...	...	...	225	...	...
Lottie	...	...	...	...	...	...	140
Matilda	...	...	...	...	...	172	...
Jane (H 4, S 2), Junior 3...	...	(361)	...	278	...	...	...

Name and Number of Cow.	Production. A	B	C	D	E	F	G
	400 and over.	350 and over.	300 and over.	250 and over.	200 and over.	150 and over.	Under 150.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.

"H," "D," and "S" signify heifer, dam, and sire, respectively. Where a number is shown after dam or sire, it signifies the number allotted by the member for the dam or sire.

NOTE.—The records of all cows milked under six months have been excluded from this summary, consequently the average yield obtained from this table does not represent the herd average production for the twelve months period reviewed.

as to enable identification to be made readily and surely after perhaps twelve or eighteen months away from the main farm, and so prevent any possibility of incorrect identity. If tattooing is adopted, it is suggested that the tattoo include a letter of the alphabet, in addition to the numbers, to denote the year in which the calf was born, *e.g.*, for a calf born in 1934 the letter A could be used, letter B for 1935, and so on.

The Annual Herd Summary.

The foregoing is the form which the annual summary of the production of a recorded herd will take in future. A summary, completed in relation to his particular herd, will be issued to each member after the close of the recording year, through the Dairy Branch district office.

The figures entered in these columns by the Dairy Branch, and those obtained by converting the yields of heifers to a mature cow basis, enable the systematic building up of the production of the herd by the keeping of heifer calves only from the highest producing cows.

When the relationship of dams and heifers, and the sires used, are also noted on the summary by the dairy-farmer, he is in a position to compare the yields of heifers with those of their dams, and to ascertain what has been the influence of the sires.

Taking the details completed in the herd summary shown on page 631 (in which the yields of the two- and three-year-old heifers, converted to a mature cow basis, are shown in parentheses), as an example, the following information is available.

Heifer calves from cows in groups B, C, D and E should be kept. In Group F only one cow ("Matilda") remains, since the others are heifers and they have been re-grouped; calves would not be kept from this cow. The cows in Group G should be replaced as fresh stock, selected from better cows, are available.

Comparison of the yields of dams with those of their daughters indicates a beneficial influence from the use of sire 2; *e.g.*, the yield of "May" is 261 lb., and that of her daughter "Molly" by sire 2, on a mature cow basis, is 294 lb. Similarly, the yield of "Nancy" (285 lb.), also by this sire, exceeds that of her dam "Ruby" by 31 lb., and the yield of "Jane" (361.4 lb.) exceeds that of her dam "Topsy" (338 lb.). Obviously, a beneficial influence has been exercised.

On the other hand, the yield of the heifer "Bertha" (297 lb.) by sire 1 from "Topsy" is less than that of the dam, and that of "Annette" (215.6 lb.), also by sire 1, is less than that of her dam, "Mary."

It is considered that strict adherence to the keeping of the records suggested, and the application of the information they provide in the selection of breeding animals will go a long way towards considerably increasing production per acre, and so assisting to combat the low prices at present existent.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
P. Ubrihien, Corridgeree, Bega ...	123	15 Aug., 1933
W. S. Turnbull, Flanders Avenue, Muswellbrook ...	37	17 ,, 1933
A. L. Logue, Thornboro, Muswellbrook ...	36	17 ,, 1933
E. W. Flower, Binna Burra ...	56	18 ,, 1933
G. V. Ralston, "Porphyry," Seaham ...	98	21 ,, 1933
E. P. Perry, Nundorah, Parkville (Guernseys) ...	30	25 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton ...	43	25 ,, 1933
Sacred Heart Convent, Bowral ...	10	26 ,, 1933
Lunacy Department, Parramatta Mental Hospital ...	12	1 Sept., 1933
Department of Education, Gosford Farm Homes ...	38	2 ,, 1933
James McCormack, Tumut ...	98	9 ,, 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys) ...	67	16 ,, 1933
E. C. Nicholson, Jillamatong, Corowa ...	180	23 ,, 1933
G. Powell and Sons, "Loch Lomond," Armidale ...	22	26 ,, 1933
E. S. Cameron, Big Plain, Narrandera ...	31	26 Oct., 1933
E. E. McMullen, Springnook, Holbrook ...	31	3 Nov., 1933
W. R. Boughton, Holbrook ...	33	3 ,, 1933
C. Maynard, Holbrook ...	12	3 ,, 1933
Lunacy Department, Callan Park Mental Hospital ...	31	20 ,, 1933
Stace Bros., Taylor-street, Armidale ...	26	1 Dec., 1933
J. L. W. Barton, Wallerawang ...	20	1 ,, 1933
Department of Education, Brush Farm, Eastwood ...	8	3 ,, 1933
Lunacy Department, Morisset Mental Hospital ...	29	7 ,, 1933
W. W. Martin, "Narooma," Urana Road, Wagga ...	150	14 ,, 1933
J. F. Chaffey, Glen Innes (Ayrshires) ...	58	15 ,, 1933
E. E. Winder, Wybong Road, Muswellbrook ...	40	22 ,, 1933
C. J. Parbery, Allawah, Bega ...	122	8 Jan., 1934
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay ...	8	9 ,, 1934
G. H. Hooper, Oak Hill, Bethungra ...	10	19 ,, 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	81	22 ,, 1934
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell ...	13	27 ,, 1934
J. B. Burtenshaw, "Sunnyside," Inverell ...	42	27 ,, 1934
Parker Bros., Hampton Court Dairy, Inverell ...	82	27 ,, 1934
New England Experiment Farm, Glen Innes (Ayrshires) ...	41	28 ,, 1934
Bathurst Experiment Farm (Jerseys) ...	31	1 Feb., 1934
W. K. Frizell, Rosenstein Dairy, Inverell...	37	2 ,, 1934
W. Pigg, Redlands Dairy, Inverell ...	27	2 ,, 1934
A. N. de Fraine, Happy Valley Dairy, Inverell ...	8	3 ,, 1934
G. L. Genge, "Easton," Armidale ...	39	7 ,, 1934
J. Davies, Puen Buen, Scone (Jerseys) ...	191	9 ,, 1934
Forster & Sons, Abington, Armidale ...	189	12 ,, 1934
Newington State Hospital and Home ...	91	16 ,, 1934
A. B. Finney, Fox Ground, Gerringong ...	33	17 ,, 1934
Lidcombe State Hospital and Home ...	153	20 ,, 1934
Lunacy Dept., Gladesville Mental Hospital ...	34	22 ,, 1934
Riverina Welfare Farm, Yanco ...	89	24 ,, 1934
Department of Education, Yanco Agricultural High School ...	39	24 ,, 1934
W. J. Miller, 199 Mann Street, Armidale ...	7	6 Mar., 1934
New England Girls' Grammar School, Armidale...	41	8 ,, 1934
F. C. Butler, Yarranung, Bega ...	122	24 ,, 1934
G. W. Young, "Boorganna," via Wingham ...	39	30 ,, 1934
Hawkesbury Agricultural College (Jerseys) ...	118	3 April, 1934
A. D. Frater, "Fairview Dairy," Inverell ...	61	5 ,, 1934
Cowra Experiment Farm ...	26	27 ,, 1934
St. Joseph's Girls Orphanage, Kenmore ...	10	4 May, 1934
G. A. Parish, Jerseyland, Berry ...	93	5 ,, 1934
Marion Hill Convent of Mercy, Goulburn ...	27	5 ,, 1934
Australian Missionary College, Cooranbong ...	72	5 ,, 1934
St. Joseph's Convent, Reynold-street, Goulburn ...	4	5 ,, 1934
St. John's Boys' Orphanage, Goulburn ...	18	5 ,, 1934
W. M. McLean, Five Islands Road, Unanderra ...	76	6 ,, 1934
Koyong School, Moss Vale ...	3	8 ,, 1934
Miss N. C. Brenan, Arankamp, Bowral ...	15	10 ,, 1934
Tudor House School, Moss Vale ...	21	13 ,, 1934
Limond Bros., Morisset ...	38	1 June, 1934
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	29	2 ,, 1934
Hurlstone Agricultural High School, Glenfield ...	44	22 ,, 1934
H. F. White, Bald Blair, Guyra (Aberdeen Angus) ...	261	28 ,, 1934
St. John's College, Woodlawn, Lismore ...	34	29 ,, 1934

Tubercle-free Herds—*continued.*

Owner and Address.	Number tested.	Expiry date.
Grafton Experiment Farm ...	271	14 July 1934
William Thompson Masonic School, Baulkham Hills ...	37	20 „ 1934
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 Aug., 1934
St. Patrick's College, Goulburn ...	8	21 Sept., 1934
S. L. Wills, Greendale Dairy, Cowra ...	28	27 „ 1934
Wagga Experiment Farm (Jerseys) ...	60	25 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	92	9 Nov., 1934
Wolaroi College, Orange ...	11	10 „ 1934
Wollongbar Experiment Farm, Lismore (Guernseys) ...	128	11 Jan., 1935
George Rose, Aylmerton ...	2	21 Feb., 1935
Mittagong Farm Homes ...	36	22 „ 1935
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	19	23 „ 1935
T. H. Maples, Racecourse Farm, Bega ...	48	2 Mar., 1935
P. M. Burtenshaw, Killean, Inverell ...	63	28 „ 1935
J. P. McQuillan, Bethungra Hotel, Bethungra ...	25	4 April, 1935
W. Newcomb, "Minnamurra," Inverell ...	85	6 „ 1935
Lunacy Department, Kenmore Mental Hospital ...	84	4 May, 1935
St. Michael's Novitiate, Goulburn ...	4	4 „ 1935
Rydalmere Mental Hospital ...	65	11 „ 1935

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—Max Henry, Chief Veterinary Surgeon.

Abortion-free Herds.

The following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free.

Owner and Address.	Number in herd.
Martin Bros., "Narooma," Urana Road, Wagga Wagga ...	86
Cann, H. J., The Gap, Alstonville ...	...
White, F. J. and Sons, Bald Blair, Guyra ...	238
Mott, T., Main Arm, Mullumbimby ...	25
Henderson & Son, Upper Wantagong, Holbrook ...	95
Hawk, J. T., Ben Lomond ...	42
Sams, C. R., Wilson's Creek, Mullumbimby ...	34

—Max Henry, Chief Veterinary Surgeon.

Infectious Diseases Reported in June.

The following outbreaks of the more important infectious diseases were reported during the month of June, 1933:—

Anthrax ...	Nil.
Blackleg ...	8
Piroplasmosis (tick fever) ...	Nil.
Pleuro-pneumonia contagiosa ...	Nil.
Swine fever ...	Nil.
Contagious pneumonia ...	3
Necrotic enteritis ...	Nil.

—Max Henry, Chief Veterinary Surgeon.

Poultry Notes.

AUGUST, 1933.

E. HADLINGTON, Poultry Expert.

Cannibalism Among Chickens.

CANNIBALISM among chickens is one of the troubles which each year causes heavy losses on some farms, and even where the rate of mortality is not high the vice causes a lot of anxiety and extra work. This trouble frequently occurs in battery brooders, but is by no means confined to this type of brooder, as it is met with in other classes of brooders as well, and sometimes after the brooding stage.

The term cannibalism covers all cases where chickens show a craving for blood by picking one another, whether on the toes, wings, tails or any part of the body. Once blood appears they mercilessly attack the victims until they kill them, if not prevented. In most cases it is possible to overcome the trouble by studying the conditions to ascertain the cause or causes of an outbreak of cannibalism. There are many factors which have to be taken into account in dealing with this problem, but generally investigation can be narrowed down to several main causes, as, for instance, insufficient salt in the ration, overcrowding, too little trough or hopper accommodation causing congestion when feeding, and too close confinement. In some instances chickens crowding into a ray of sunlight leads to toe or feather picking on account of the sunlight showing up the blood, particularly in the feather quills at certain stages of feathering.

An excess of concentrates in the ration may be responsible in other cases for this craving for blood, and, on the other hand, a deficiency of minerals and mineral salts, such as those contained in bone meal, shell grit, green feed and milk or milk products, may also be a contributing factor.

In battery brooders particularly, but also in other types, where chickens are kept confined, lack of fresh air also appears to be conducive to an outbreak of cannibalism.

The first step in dealing with this vice is to remove any chicks which show signs of being attacked and lightly paint the part, which has been picked, with stockholm tar. This should be followed by an investigation into the feeding methods, to ascertain whether there is any deficiency in the ration, particularly as regards salt. Where wet mash is used, even if an ounce of salt to each 5 lb. of mash is being given, the quantity may be increased by using an ounce to 4 lb. for a time, to see if this will overcome the trouble. In cases where dry mash is fed it would not be safe to give the same quantity, but the amount could temporarily be increased to three-quarters of that mentioned for a wet mash.

It is a good plan to reduce the number of chicks in the brooders even if they are not overcrowded, and where possible give them a grassy run. Failing this a few pieces of grassy turf placed in the run to keep the chickens busy is sometimes effective.

Exhibit for World's Poultry Congress.

The shipment of five trios of birds on 10th July by the s.s. "Esquilino" to the World's Poultry Congress should be the means of bringing Australian poultry under the notice of breeders all over the world, and provided the birds arrive in Rome in good condition they will surpass any of the exhibits of the same breeds seen at the Congress held in London in 1930. The length of time on the journey and the period of the year certainly places birds from this country somewhat at a disadvantage compared with countries in the northern hemisphere, but every effort has been made to ensure their safe arrival, and the keen interest and co-operation of the Italian Consul-General (Marquis A. Ferrante) greatly facilitated the arrangements for forwarding the birds.

The shipment comprised two trios of Australorps, two trios of White Leghorns, and one trio of Rhode Island Reds. The Australorps came from Mr. F. D. R. McCallum and the Department of Agriculture, the Leghorns from Messrs. C. A. Clark and Son and the Department of Agriculture, and the Rhode Island Reds from Messrs. A. Fortune and C. E. Messervy, the former contributing the cockerel and the latter the two pullets. In each case the owner of the birds agreed to bear the expense of shipping them—something less than £2 per bird. It was considered advisable to send some birds with laying records and, in view of this, the Department sent two Australorp hens with records of 243 and 235, and two White Leghorn hens which laid 239 and 240 eggs.

It may have been possible to arrange a large display of birds had the number not been restricted by the Congress authorities to two trios of each breed.

The necessity for sending the birds so early was due to the fact that there was no other steamer calling at Italian ports which would take them, but arrangements have been made for the Congress authorities to have the birds cared for after their arrival, which will be a couple of weeks before the Congress opens. This will, however, be an advantage as they will have a chance to recuperate after the journey.

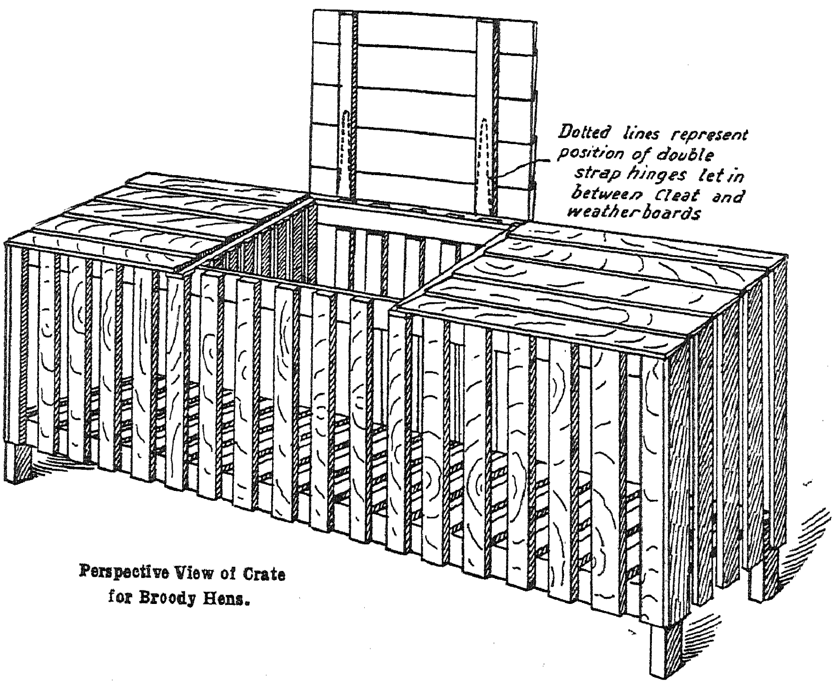
Handle the "Broodies" Systematically.

With the first flush of spring laying there is usually a crop of broody hens to be dealt with among the heavy breeds, and later in the summer the numbers greatly increase. On a farm where mostly heavy breeds are kept,

any carelessness in dealing with the broodies causes a far greater loss in egg production than is generally realised, and yet there are very few farms where suitable provision is made for coping with the problem.

In many cases the broody hens are merely placed in a pen night after night, and every now and then they are sorted over to put back in the pens those which have gone off the brood. The result is that many hens are left longer than is necessary and others are put back too soon, and remain in a semi-broody state for days, with consequent loss in egg production.

Another more prolific source of loss is where the broody hens are allowed to remain in the pens because they fly off the nest when the eggs are being collected. If such hens are left for a few days they will become properly broody, and it will take much longer to get them off the brood. The only way to avoid this trouble is to make a practice of catching all "clucky" hens each night. This may be done by closing the door of the house before collecting the eggs, and catching all birds that fly off the nest.



Perspective View of Crate for Broody Hens.

The best method of dealing with these hens is to make crates of the type here illustrated. The crates can be made in sizes to suit requirements, but a handy size is 9 feet long, 2 feet wide and 2 feet high, either with a sloping roof opening at the top (as illustrated), or the top may be covered with a sheet of corrugated iron, having sufficient slope to shed rain, in which case one slat in the front of each compartment should be movable to enable the birds to be put in and taken out. The crate may be divided into two or

three compartments according to the number of hens it is desired to put in at one time. A crate 9 feet long divided into three compartments would accommodate six hens in each.

Each night's broodies should be kept separate, and if they are caught at the first sign of broodiness they will be off the brood in about four days, but for every day they are allowed to remain on the nest they will require to be left two to three days longer in the crate.

It is a good plan to attach an adjustable flap on the weather side of the crate, so that in the cold weather it may be closed, and in the hot weather propped up to shade the birds from the sun and at the same time allow a breeze through the crate. The water and feed vessels should be placed on the outside. If desired, one side and the ends and divisions may be covered with netting instead of battens, but an essential feature is a slatted bottom so that the birds cannot sit comfortably and remain broody.

Some poultry farmers make a practice of partly starving broody hens in order to keep them active and get them off the brood more quickly, and while there may be no harm in keeping them keen for their food, care is necessary, particularly from the end of the year onwards, as any undue starving is likely to throw the birds into a moult.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Peak Hill (W. R. L. Crush)	Aug. 1, 2
Trundle (D. Leighton)	„ 8, 9
Condobolin (J. M. Cooney)	„ 15, 16
Gilgandra (G. Christie)	„ 15, 16
Grenfell (W. Mychencharane)	„ 22, 23
Wagga (F. H. Croaker)	„ 22 to 24
Bogan Gate (J. T. a'Beckett)	„ 23
Parkes (L. S. Seaborn)	„ 29, 30
Young (T. B. Tester)	„ 29 to 31
Lake Cargelligo (C. W. Hutchens)	„ 30, 31
Holbrook (Thelma Stewart)	„ 31, Sept. 1
Gosford	Sept. 1, 2
Forbes (E. A. Austin)	„ 5, 6
Murrumburrah (W. Worner)	„ 5, 6
Ungarie (D. R. Bedford)	„ 6
Singleton (J. T. McMahon)	„ 6 to 8
Boorowa (S. G. Hughston	„ 7, 8
Cowra (E. P. Todhunter)	„ 12, 13
West Wyalong (J. A. Smith)	„ 12, 13
Barmedman (S. S. Penberthy)	„ 16
Canowindra (W. E. Frost)	„ 19, 20
Temora (J. M. McInnes)	Sept. 19 to 21
Lockhart	„ 21
Barellan (W. H. McRae)	„ 27
Eugowra (R. K. Douglas)	„ 27
Quandialla (Stuart Tomkins)	„ 27
Hillston	„ 27, 28
Berrigan	„ 28
Hay	„ 28, 29
Hall (F.C.T.)	„ 29, 30
Narrandera (J. D. Newth)	Oct. 3, 4
Deniliquin (P. Fagan)	„ 4
Walbundrie (H. G. Collins)	„ 4
Ardlethan (L. Smith)	„ 4
Bribbaree (J. Ashton)	„ 4
Leeton (E. C. Tweedie)	„ 10, 11
Corowa (H. G. Norton)	„ 10, 11
Ariah Park (M. Collins)	„ 11
Carcoar (T. G. Stammers)	„ 11
Griffith (M. E. Sellin)	„ 17, 18
Cootamundra (G. B. Black)	„ 24, 25

1934.

Inverell (E. A. Clarke)	Feb. 20, 21, 22
Queanbeyan	Mar 2, 3
Goulburn	„ 15, 16, 17
Gloucester	Mar. 20, 21
Kempsey	April 11, 12, 13
Dungog (W. H Green)	„ 19, 20, 21

Sown pastures are usually more productive than "natural" pastures, and in the majority of cases are also more remunerative. Natural pastures are generally not suitable for specialised dairying, and sown pastures are usually essential for this purpose.

The Farmer's Library.

Reviews of Recently Published Books.

"Practical Sheep Farming."

By TOM C. NORRIS.

WHILE much that is written in "Practical Sheep Farming" may appear somewhat elementary to the established grazier in this country, the small flock-owner, and especially the beginner will find it well worth reading. The subject is treated from a slightly different angle to most books on sheep raising; it deals in a practical way with the every-day handling of the flock—an art which appears to be taken for granted by most writers on the subject. It is not a work of reference, but rather a book to be read and remembered.

The author, Tom C. Norris, claims sheep breeding experience in both Australia and South America.

Our copy from the publishers, George Allen and Unwin Ltd., London

"Physiology of Farm Animals."

By F. H. MARSHALL and E. T. HALNAN.

WE have formed a very favourable impression of Marshall and Halnan's "Physiology of Farm Animals," a copy of which has been forwarded to us by the Cambridge University Press, London. While primarily intended for veterinary and agricultural students, and certainly too advanced for the average farmer, many of its chapters are very readable, and it should be possible for breeders of a studious type of mind to glean much that would be of value to them from this book.

The scope of the book in general is very complete, although perhaps the section on wool could, we think, have been considerably enlarged upon with advantage.

"Fertilizers and Food Production on Arable and Grass Land."

By SIR FREDERICK KEEBLE.

BY far the greater part of the contents of this book is devoted to the use of fertilisers on grassland, and it is this section which will command most interest from the Australian farmer. Although the Australian reader will have to interpret most, if not all, of the fertiliser recommendations given and implied in this book in terms of the local practices, it is well worth reading as a statement of the possibilities, general principles and problems of grassland improvement and management.

Our copy from Humphrey Milford, London; Oxford University Press.

"An Introduction to the Scientific Study of the Soil."

By NORMAM M. COMBER.

PROFESSOR Comber, of the University of Leeds, requires no introduction to students of agriculture as an authority on soil science. In this, the second, edition of his book major alterations comprise a much lengthier chapter on soil microbiology, and a rewritten section on mechanical analysis, the latter being found necessary in view of recent rapid developments in this branch of soil chemistry. Other parts of the book have been brought up to date.

The book presents a concise and authoritative statement of the science of the soil, readily acceptable to students and not beyond the progressive farmer.

Edward Arnold and Co., Publishers, London, forwarded our copy.

"Cacao." [2nd Edition.]

By Dr. C. J. J. VAN HALL.

THE author of this book was one time Director of the Institute for Plant Diseases in Java and also Director of Agriculture in Surinam. The book is an excellent and comprehensive reference work on the cacao plant, but of very limited interest, of course, in a country where the plant is not grown commercially.

Our copy from Macmillan and Co. Ltd., London.

"Turkey Production."

By L. E. CLINE.

THIS is a revised version of L. E. Cline's book that was first published in 1929. Our copy to hand from the Orange Judd Publishing Co., New York. The book deals comprehensively with all phases of turkey production, it being based on many years' practical experience by the author, combined with a review of all recent scientific and practical literature on the various phases dealt with. Its 436 pages (with 114 figures) contain chapters on the origin and history of the domestic turkey, breeds and breeding, care and management, equipment, incubation, brooding and feeding of young turkeys, fattening for market, preparation for market and marketing, costs of production, diagnosis of diseases, treatment of diseases, deformities, internal and external parasites.

"Turkey Production" is retailed in U.S.A. at 3.50 dollars, plus postage, but readers of the *Agricultural Gazette,* by mention of the fact when sending their orders to the Orange Judd Publishing Co., 15 East 26th street, New York, N.Y., will be given a special discount of 40 per cent., making the total cost 2.35 dollars per copy post paid to any address in this country.

CONTENTS.

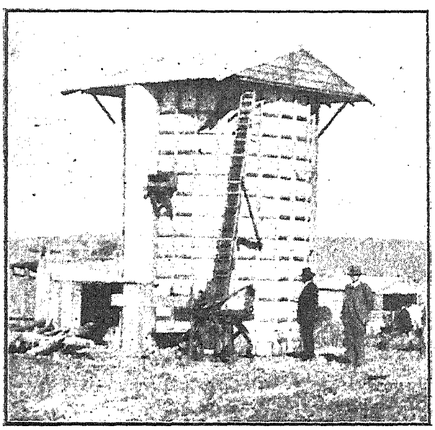
Agricultural Gazette of New South Wales.

Fodder Conservation Fundamental to Success in Dairying.

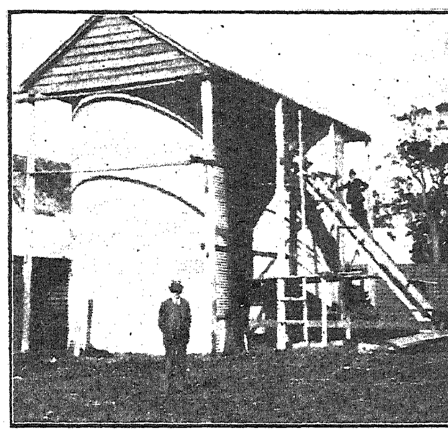
Coastal Fodder Conservation Championships, 1933.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

The fodder conservation championships promoted by the Royal Agricultural Society in coastal districts this year were most successful. Sixteen societies organised competitions, of which eleven were in the South Coast division. In every instance, the competitors in the South Coast competition had conserved sufficient fodder to hand-feed their dairy herds for the five winter months, and there was also a surplus of fodder to provide for any lean period that might occur during the remainder of the year. Excepting in the case of one competitor, the same could be said of the competitors in the North Coast division, where the conservation of fodder is a comparatively new departure.



Galvanised-iron Overhead Silo at Dorrigo.



Mr. Norman Bate's Overhead Silos at Bodalla.

Advance in fodder conservation is not confined to competitors only, for there is abundant evidence that coastal dairy-farmers generally are paying more attention to the provision of fodder reserves, and this may be largely attributable to the excellent publicity which has been given to this subject by these competitions. The availability of advances on easy terms from unemployment relief funds for the purpose of construction of silos has also been a strong factor in stimulating activity in the conservation of fodder. Reference might also be made to the enterprise of the North Coast Steam Navigation Company, in advancing money, on extremely favourable terms of repayment, for the erection of concrete silos in the Clarence River and Macleay River districts. As the provision of fodder for the feeding of dairy

* Mr. Stening judged the championship competitions on the north and south coast.

herds during lean periods may be regarded as a fundamental to success in dairying, the company is to be commended on the wisdom of its action.

The conditions and scale of points for judging the competitions in coastal districts are as follows:—

CONDITIONS.

Fodders Eligible for Conservation to be concentrates (including all grains); or roughage —as hay (*e.g.*, lucerne, oaten, wheaten, clover, grass), silage, and any other fodder suitable for conservation—to have been produced on the land owned, leased or held on shares by the competitor. No farmer or grazier whose property consists of less than thirty (30 acres will be eligible to compete.

SCALE OF POINTS FOR JUDGING—COASTAL AREAS.		Points.
1. *Suitability and quality of fodder*		65
(*a*) Judged according to the suitability of fodder or combination of fodders for the purposes for which they are required	30	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values	35	
2. *Location and protection*		40
(*a*) Locality—location of the site, having regard to fire, flood, economy in feeding, and general access	20	
(*b*) Protection—protection from weather, pests, stock, fire and general deterioration	20	
3. *Economy of production*		25
Including land value, production, storage and feeding costs.		
4. *Carrying capacity*		60
Quantity for the requirements of competitor's holding to be based on the carrying capacity of the holding (when improved and under natural pasture). The maximum amount considered to be competitor's requirements per cow to be 20 cwt. lucerne hay or its equivalent in feeding value. (1 cwt. lucerne hay = $1\frac{1}{2}$ cwt. cereal hay = 3 cwt. silage = $\frac{1}{2}$ cwt. grain).		
5. *Quantity of fodder in excess of requirements*		10
At the rate of 5 points for surplus fodder equal to quantity required for the holding.		
Total		200

The South Coast Championship.

The societies which conducted competitions were Bega, Berry, Bodalla, Camden, Cobargo, Dapto, Kiama, Moruya, Nepean (Penrith), Pambula and Shoalhaven (Nowra). Judging was commenced at Pambula on 5th June and completed at Penrith on 10th idem.

TABLE of Awards—South Coast Championship.

Competitor.	Society.	Suitability.	Quality.	Location.	Protection.	Economy of Production.	Carrying Capacity.	Surplus.	Total.
Ken. Colless, "Inverleigh," Emu Plains	Nepean (Penrith) ...	28	33	18	18	21	60	7	185
N. S. Bate, "Old Bodalla," Bodalla ...	Bodalla	29	31	18	19	22	60	5	184
J. Masters, "Bundywalla," Berry ...	Berry...	28	32	19	18	23	60	3	183
D. A. Timbs, "Elmgrove," Dapto ...	Dapto	28	32	17	18	28	60	3	181
O. Guthrey, "Elmgrove," Bega ...	Bega	28	32	17	18	21	60	3	179
F. J. D. Doust, "Lynn Farm," Camden...	Camden	28	30	19	18	21	60	2	178
L. D. Hawdon and M. Weeks, "Durham Farm," Moruya.	Moruya	27	30	16	18	22	60	3	176
R. E. Salway, "Narira," Cobargo ...	Cobargo	24	31	18	18	23	60	1	175
J. M. Lamond, "The Willows," Terara	Shoalhaven (Nowra)	27	30	16	18	22	60	1	174
J. A. Martin, "Woodlands," Pambula...	Pambula	24	29	16	18	20	60	6	173
C. R. Chittick, "Lemon Grove," Jerrara	Kiama	24	29	18	18	22	60	1	172

Mr. Colless Wins at First Attempt.

That Mr. Colless should win the championship at his first attempt is a splendid achievement. His property, situated on the Nepean River, is only 85 acres in area, and the greater proportion is under cultivation with fodder crops. Lucerne crops occupy 15 acres, while maize for green fodder and silage was produced on 17 acres, maize for grain 3 acres, sorghum 8 acres, oats for green feed 7 acres. In a shed adjoining commodious feeding stalls silage was conserved in two pits, which were lined with brick plastered with cement; one round pit was 25 feet deep, and the other was oval in shape and 20 feet deep. The silage was of good quality, made from chaffed maize fodder, except for a small quantity of sorghum used to top-up one pit. In the shed adjacent to the feeding stalls 25 tons of lucerne hay of high quality was neatly stacked, and an additional reserve of a similar quantity of lucerne hay was stacked in another shed, with 5 tons of grass hay. Five tons of maize in cob completed the total quantity of fodder, which was sufficient for the feeding of ninety-one head of cattle for the stipulated period—nearly two and a half times the requirements. The combination of fodders was satisfactory for the feeding of a balanced ration, and the protection and general lay-out of the fodders for convenience of feeding left little to be desired.

Mr. Norman Bate, who was successful in winning the second prize, has been a very consistent competitor in fodder conservation competitions since their inception, and has succeeded in winning a second and a third prize in previous championships, besides being runner-up in the local competitions on the other occasions. His entry was of a particularly high standard, and he was somewhat unfortunate in being defeated for the championship by the narrow margin of one point. Mr. Bate's farm, "Old Bodalla," which is a portion of the original Bodalla Estate, consists of 685 acres, of which an area of 125 acres is flats of high fertility and good carrying capacity. The crops grown during the year comprise 6 acres of maize for grain, 7 acres of maize fodder for silage, 4 acres of sorghum, 12 acres of oats, 6 acres of lucerne, and 10 acres of red clover. The reserves of fodder were of great variety, consisting of 207 tons of maize silage conserved in two tower silos (one constructed of concrete blocks and the other of reinforced concrete) and one pit silo of 35 tons of red clover silage, all adjacent to the feeding stalls. Also one trench silo of 57 tons of pasture silage remote from the feeding centre, 12 tons of oaten hay, 9 tons of grass hay, and an aggregate of 36 tons of lucerne and red clover hay conveniently located. Twenty tons of maize in cob were stored in a well-designed corn crib, erected on piles which afforded protection to the grain from the ravages of mice and rats, and allowed of ample ventilation. This was the largest reserve of fodder on any individual farm in the competition, but the area of the farm was also the largest. The total quantity was sufficient for the feeling of 190 head of cattle for the specified period, or just over double the requirements.

The third prize was won by Mr. J. Masters, who made his first appearance in the championship competitions, although he has repeatedly competed in the local competition. His holding of 406 acres is second-class hill country, of which 4 acres are under lucerne, 11 acres were used for producing maize fodder, 5 acres maize grain and 5 acres sorghum. The stored fodder comprised 133 tons chaffed maize silage conserved in twin concrete tower silos, 33 tons lucerne hay and chaff, all adjacent to the feeding stalls, and 18 tons of maize in cob stored in a loft. The whole was of high quality, and the total quantity greatly exceeded requirements.

The North Coast Championship.

This is the second year in which a championship has been held on the North Coast, and five societies were represented, namely, Bellinger River, Dorrigo, Macleay River, Manning River, and Upper Manning River agricultural societies. The judging was commenced at Bellingen on 13th June, and completed at Taree on 15th idem.

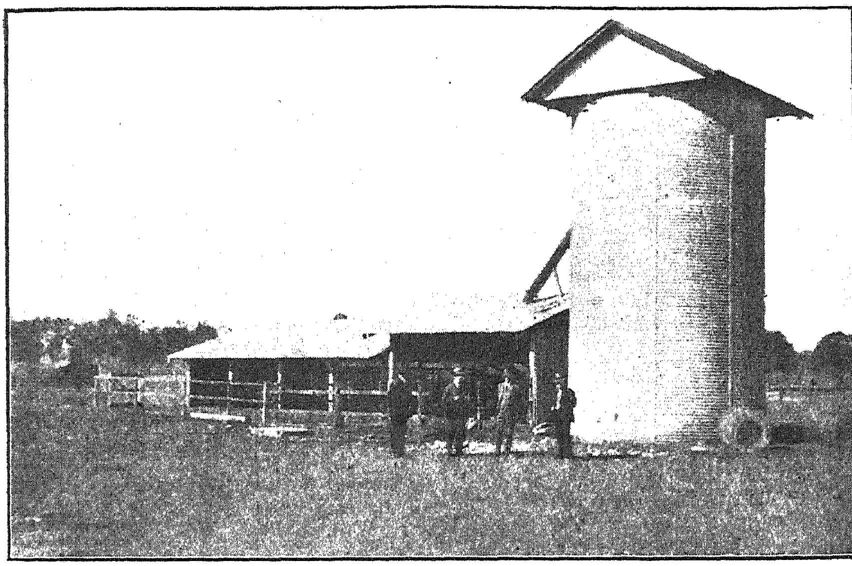
TABLE of Awards—North Coast Championship.

Competitor.	Society.	Suitability.	Quality.	Location.	Protection.	Economy of Production.	Carrying Capacity.	Surplus.	Total.
F. O. Stokes and W. G. Sawyer, "Brumarlin," Mondrook.	Manning River ...	29	30	18	18	22	60	5	182
E. L. R. Keech, "Dungannon," Wingham.	Upper Manning River	29	31	18	18	21	60	1	178
Mrs. H. M. Hindmarsh and Sons, "Wiaraga," Bellingen.	Bellinger River ...	27	32	16	18	23	60	1	177
W. S. Hogan, "Booroola," North Dorrigo.	Dorrigo	24	30	19	17	23	60	1	174
D.M. Dorman, "Lawnbank," Frederickton.	Macleay River ...	28	30	15	18	21	56	0	168

The Fodders Conserved by the Prize Winners.

The championship was won by Messrs. F. O. Stokes and W. G. Sawyer, who were successful in carrying off the second prize in the preceding year's championship. As an indication of the improvement that has been effected, the total points awarded were eleven in excess of the previous effort. The property of 198 acres varied from fertile river flats to poor forest country, and the best of the land was devoted to a variety of fodder crops, 14 acres being under lucerne, 10 acres used for the production of maize for fodder, 7 acres of maize for grain, 6 acres of sorghum, 6 acres of oats, 4 acres of wheat and field peas and 2 acres of cow cane. The conserved fodders included 80 tons of chaffed maize silage in a concrete tower silo, 38 tons of lucerne hay stacked in a large shed, all convenient to the feeding stalls, and 12 tons of maize grain stored in a barn. The total quantity of fodder was double the requirements, and the general quality and combination of fodders were of a high standard.

Mr. Keech, who secured the second prize, improved on the total points awarded him in the preceding year's competition by no less than 30 points. His dairy farm of 56 acres, consisting of rich river flats, is a good illustration of the "little farm well tilled." The whole area except 6 acres is devoted to cropping for the production of fodder for the stock, including 13 acres under lucerne, 10 acres for maize fodder, 10 acres for maize grain, 2 acres for sorghum, and 10 acres for oats. The fodder reserves comprised 50 tons of silage conserved in an oval concrete pit 20 feet deep, of which one-half was chaffed sorghum, one-quarter chaffed maize, and one-quarter lucerne; 22 tons of lucerne hay stacked in a shed and 5 tons of maize in cob, all conveniently situated and well protected. The total quantity exceeded requirements, and the quality and combination of fodders were very satisfactory.



Concrete Silo with Feeding Stalls and Feed Shed Attached.

The third prize was awarded to Mrs. H. M. Hindmarsh and Sons, who won the preceding year's championship, scoring the same total number of points. The property of 146 acres ranges from alluvial river flats to forest country, and the cropping area includes 14 acres of maize for grain, 7 acres of maize for fodder, 2 acres of lucerne, 1 acre of red clover and ½ acre of Indian cane. The conserved fodder consisted of 105 tons chaffed maize silage in three square pits 10 feet deep, covered with a roof at a convenient height, 3½ tons of lucerne hay and 6 tons of red clover hay; also, 5 tons of maize cobs in a barn. The total quantity exceeded the requirements for the feeding, for the stipulated period of five months, of the number of cattle that the

property was capable of carrying when under natural pasture. The quality of the fodder was good, but there was insufficient lucerne or clover hay to provide for the feeding of a balanced ration.

Maize Silage in General Favour.

All competitors except one relied on silage as the foundation of their conserved fodders, and almost generally maize was the crop ensiled. Silage is ideal for the bulk portion of the feeding ration, and on account of its high yields of fodder maize is the most economical crop. On fertile soils in coastal districts no other crop can approach it in the production of total nutrients per acre. On poorer soils sorghum is a better yielding crop and can be substituted for maize.

Grass Stack Silage on the Macleay River.

The wastage in stack silage is so great that this method of making silage is discouraged, except perhaps for surplus pasture growth.

Four different methods were adopted for conserving silage; the tower silo, pit silo, trench silo and stack. The tower silos were constructed of reinforced concrete, cement blocks, bricks, and plain galvanised iron. The tower silo is generally regarded as the best on account of its general efficiency, durability and convenience, but there are some dairy-farmers who prefer the pit silo, owing to the lower initial cost. Five competitors used pit silos, varying in depth from 10 to 25 feet. The shallower ones may be described as "just a hole in the ground," while the deeper ones were lined either with concrete or with single brick plastered with cement. In most instances the pits were constructed by the farmers themselves, and there

appears to be no valid reason why this type of silo, constructed under suitable conditions, should not be just as efficient, durable and convenient as the tower silo. Of course, there are limitations as to sites where pits may be excavated; for instance, the soil should be of such a nature that will permit of digging without caving in, and therefore sandy and gravelly soils are not suitable, nor is land with rock formation that would make sinking too difficult. A permanent ground water-table close to the surface, or danger of seepage, would also be an obstacle to the construction of a pit silo. The chief advantages of the pit over the tower silo are its lower cost of constuction, and the fact that the fodder can be chaffed straight into the pit, thus dispensing with an elevator. Provision, however, must be made for lifting the silage out of the pit, but the windlass and apparatus used for lifting the earth from the pit when excavating may later be used to hoist the silage, and by installing a carrier track the silage can be conveniently conveyed to the feeding stalls.

Danger of Gas in Deep Pits.

A warning is given here with regard to the danger of gas in deep pit silos. When filling the pit and the freshly-cut fodder becomes heated, carbonic acid gas is given off, and when the air is still the gas accumulates on the surface of the fodder, so that it would be dangerous to descend into the pit first thing in the morning before filling operations begin, but the danger is removed a few minutes after the chaff-cutter is started, as the air is disturbed by the fodder falling into the pit, and the gas is dispersed.

Five competitors adopted the trench type of silo. This most economical method of conserving silage has become very popular in coastal districts, and within the last two years a considerable quantity of fodder has been conserved underground in this manner. The trenches can be excavated with a plough and scoop by the farmers themselves during slack periods, without any cash outlay. One trench was made 10 feet deep, but as the chief objection to this method is the difficulty of removing the silage from the trench, it is better that they should be no deeper than 6 feet, preferably 4 or 5 feet, and the fodder stacked high above the ground level before covering. It is an advantage to have two trenches 4 feet deep rather than one 8 feet, for not only is the silage more easily removed, but, at the time of filling, the fodder can be settling in one while the other is being filled.

Only one competitor conserved silage by the stack method, and in this case it was grass silage, but the proportion of fodder spoiled by the use of this method is considered to be excessive. In this instance it was about 25 per cent., and the proportion is greater with small stacks and with coarse-stemmed crops. It is much more economical to excavate a pit, in which the fodder can be conserved with practically no waste.

An outstanding improvement this year was the provision of lucerne hay by every competitor. Silage requires to be supplemented with a fodder rich in protein, in order to assist in supplying a feeding ration that is well balanced, and for this purpose lucerne or clover hay is unequalled.

Ploughing.

Draught and Setting the Plough.

T. H. PATTERSON, H.D.A., Instructor in Agriculture, Hawkesbury Agricultural College.

PLOUGHING is the first operation in the preparation of a seed-bed, but notwithstanding the fact that it is such a fundamental and essential farm operation, it is often badly done; it is surprising how little thought is sometimes given to it.

In years gone by farmers took great pride in their ploughing. The once-popular ploughing matches were evidence of this, and, in some countries, they still evoke great interest and encourage good ploughing. The Junior Farmers' Clubs of New South Wales are to be commended for reviving these essentially rural contests, and it is to be hoped that soon again farmers will take more interest and pride in turning a straight, clean, and even furrow. Such ploughing means good ploughing and it pays. The ploughing championship is always a popular feature of the year's activities at Hawkesbury Agricultural College.

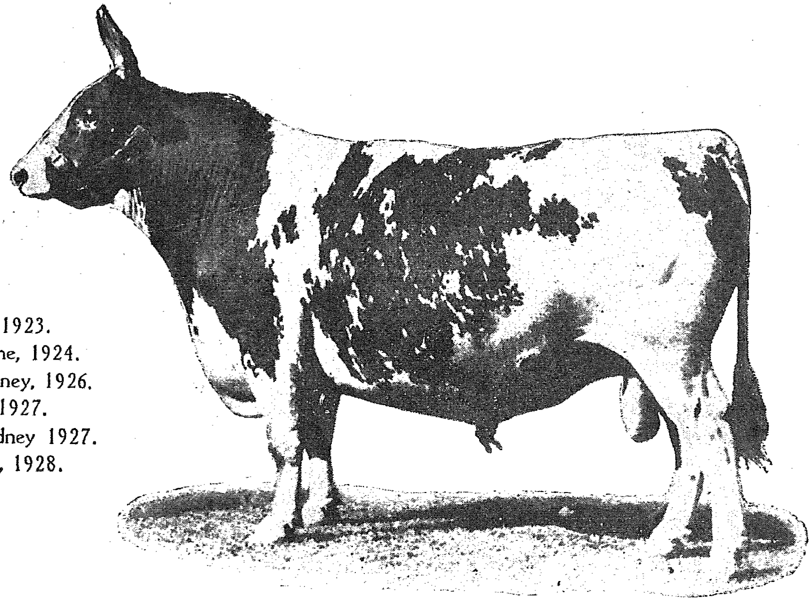
Construction of the Plough.

THERE are many types of ploughs made for doing various types of work. It would take too much time and space to describe them all, but the construction and adjustment of the ordinary single-furrow mouldboard plough will serve to illustrate the basic principles underlying ploughing. Since correct adjustment and setting of the plough mean less work for the team and the ploughman, an understanding of these principles is well worth while.

A plough consists essentially of a vertical cutting edge—the coulter; a horizontal cutting edge—the share; and a side sheet of metal—the mouldboard. The coulter makes the vertical cut and the share the under cut, whilst the ribbon of earth thus cut off passes back along the mouldboard, which twists it into a vertical position and then pushes it over until it lies against the preceding furrow-slice. The other parts of the plough are constructed to make it easier to control and to do special work.

Draught.

To use the plough certain forces, which act in opposition to its forward movement, have to be overcome. The coulter in cutting through the soil opposes the forward movement of the plough. The share cuts the bottom of the slice and lifts it towards the mouldboard; here the force opposing forward movement is mainly backward and downward. The mouldboard's pressure in opposition to the movement of the plough is backward and downward at the front, and to the left throughout the remainder of its length.



1st—2 yrs.—Melbourne, 1923.
1st & Champ.—Melbourne, 1924.
1st & Res. Champ.—Sydney, 1926.
1st & Champ.—Sydney, 1927.
2nd Bull & Progeny—Sydney 1927.
1st Bull—4 yrs.—Sydney, 1928.

First 27 females sired by Scottish Pride of Gowrie Park (3797) averaged 243.6 lb. butter-fat in 273 days on first calves as two-year-olds.

SCOTTISH PRIDE OF GOWRIE PARK (3797).

[Stationed at New England Experiment Farm, Glen Innes.]

Select Your Ayrshire Stud Stock from

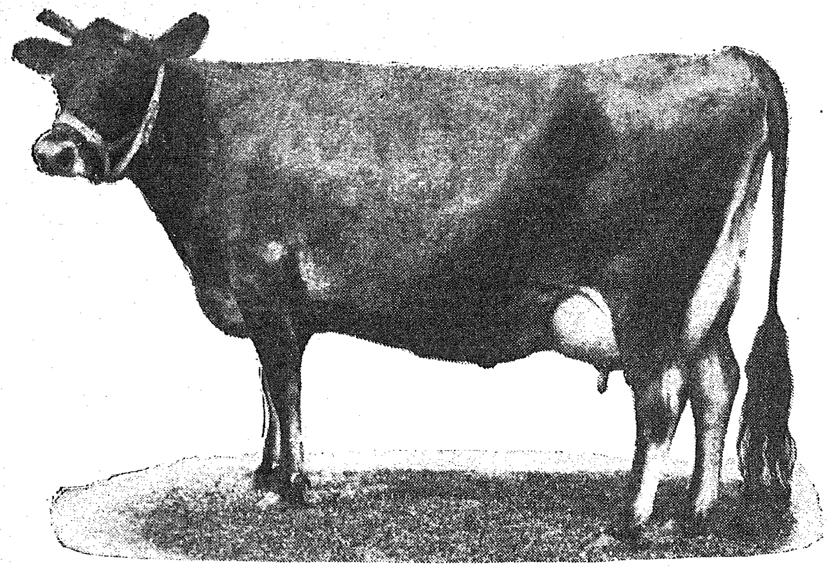
GRAFTON EXPERIMENT FARM——NEW ENGLAND EXPERIMENT FARM.

Both farms' herds are listed as tubercle free. Both farms' herds contain 100 per cent. negative reactors to the agglutination test for contagious abortion.

The Department also has for sale young bulls from tested dams of the following breeds:—

MILKING SHORTHORN - JERSEY - GUERNSEY

Applications should be made to—THE UNDER SECRETARY, Department of Agriculture, SYDNEY



LADY TRENTON IV OF BATHURST (14083).

The following are the Herd-testing Records of some of the Cows in Departmental Herds:—

Jersey Cow: WAGGA GLADYS (7778). This cow holds a world's record for butter production for the Jersey breed—22,847 lb. milk, 1,517 lb. commercial butter in 365 days. Awarded Champion Ribbon, Peter's Prize, R. A. Show, 1928. *Guernsey Cow:* WOLLONGBAR PARSON'S RED ROSE 20th (730). Holds a world's record for butter production for the Guernsey breed—17,252.5 lb. milk, 1,302·62 lb. commercial butter in 365 days. *Ayrshire Cow:* MISS DOT OF GLEN INNES (3760)—19,562·5 lb. milk 1,088·64 lb. commercial butter in 365 days.

The Department has for sale young bulls from tested dams of the following breeds:—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

For further particulars apply to—The UNDER SECRETARY, Department of Agriculture, SYDNEY.

The relative amounts of the resistances of the coulter, share, and mouldboard vary considerably under different circumstances, but all the forces can be resolved into a single force (the draught) acting from a point known as the "centre of resistance." It has been estimated that it takes 55 per cent. of the total draught to cut the furrow slice, and 12 per cent. to turn it over, leaving 33 per cent. as absorbed power due to friction on the plough sole and landside. A blunt share will increase the draught as much as 40 per cent.

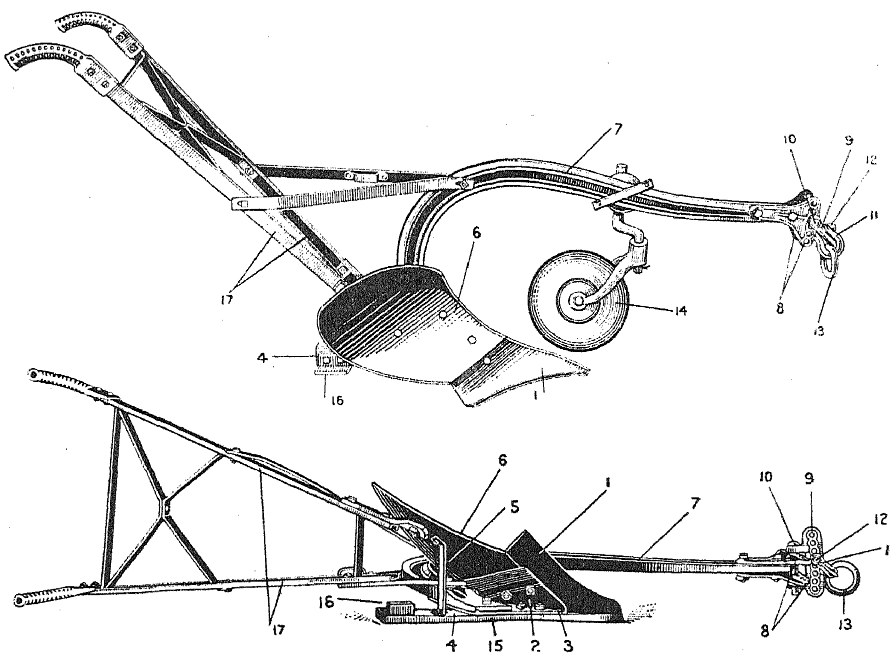


Fig. 1.—Single-furrow Mouldboard Plough, showing Parts.

1.—Share; 2.—Frog or body casting; 3.—Fore-end of body casting on which share fits; 4.—Landslide; 5.—Brace; 6.—Mouldboard; 7.—Beam; 8.—Jaws of vertical clevis (also known as "cock," "quadrant," "T head" etc.); 9.—Cross clevis or bridle (often called the "rack" "T head," or "clevis"); 10.—Adjusting stay; 11.—Shackle; 12.—Clevis pin for shackle; 13.—Hitch (ring); 14.—Disc coulter; 15.—Sole or slade; 16.—Heel plate; 17.—Handles.

With the commonly-used type of short, upright single mouldboard plough, cutting a furrow about 10 to 11 inches wide and about 6 inches deep, the centre of resistance is about 15 inches back from the point of the share, 2 inches above the base line of the plough, and 3 inches to the right of the landside, that is, near the lower front point of the mouldboard (see Figs. 2 and 3)*. This point, however, is not fixed, but varies according to the forces opposing the advance of the plough. As it is not possible to apply the line of draught horizontally from the centre of resistance, then a beam becomes necessary. The line of draught, therefore, inclines diagonally

* In a two-furrow plough, the centre of resistance will lie halfway between the points "C" in each plough-bottom. In a three-furrow plough, the centre of resistance will coincide with the point "C" on the middle plough-bottom.

from the point of application of power (midway between the inside trace chains between the hame hooks on the horses), through the hitch at the clevis to the centre of resistance (see Fig. 2).

The makers of ploughs ensure that the beam is of such a height and length that with movement of the position of the adjustable stay in the jaws of the vertical clevis the correct line of draught can always be obtained. The body beam must be high enough to clear the furrow in

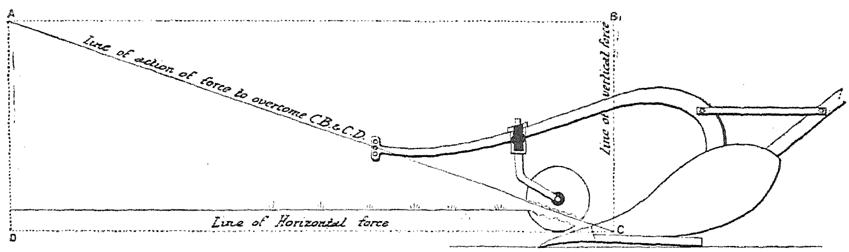


Fig. 2.—Diagram showing Forces to be Overcome in Ploughing.

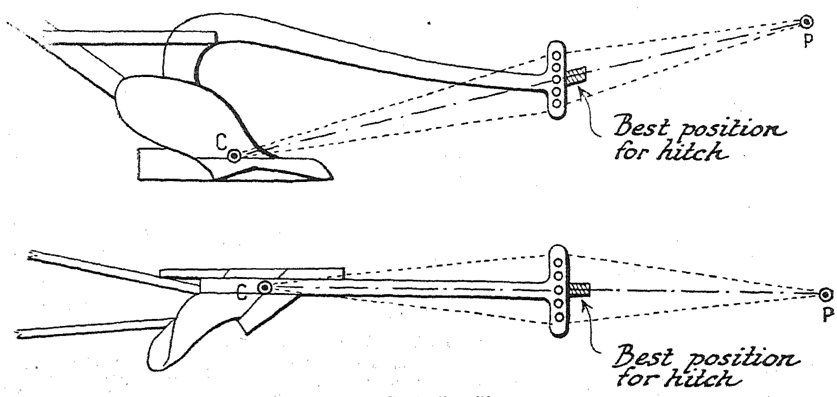


Fig. 3.—Diagrams Illustrating Lines of Draught.

Upper.—Viewed from side showing positions of hitch in vertical clevis.
Lower.—Viewed from above, showing positions of hitch in cross clevis.
NOTE.—The broken line (thus — - — -) shows the line of draught to secure the greatest efficiency in pulling the plough. The dotted lines (thus - - - - - -) show adjustments that may be necessary to suit the plough, soil, or other conditions. When ploughing, of course, the point P (centre of power), the hitch (in any position), and the point C (centre of resistance) are in the same straight line.

front, and long enough to bring it into the true line of draught. To permit this line of draught to be maintained, the end of the beam is fitted with a closs clevis or bridle provided with numerous holes for lateral adjustment, and a vertical clevis, somewhat quadrant-shaped, perforated with holes, and carrying the adjustable stay for the cross clevis (see Fig. 1). The sliding head, consisting of a pin and shackle, can be moved from side to side to adjust the line of draught laterally to aid the holder in steering the plough; and the adjustable stay can also be raised and lowered in the vertical clevis to correct the tendency for the point of the share to run unduly upwards

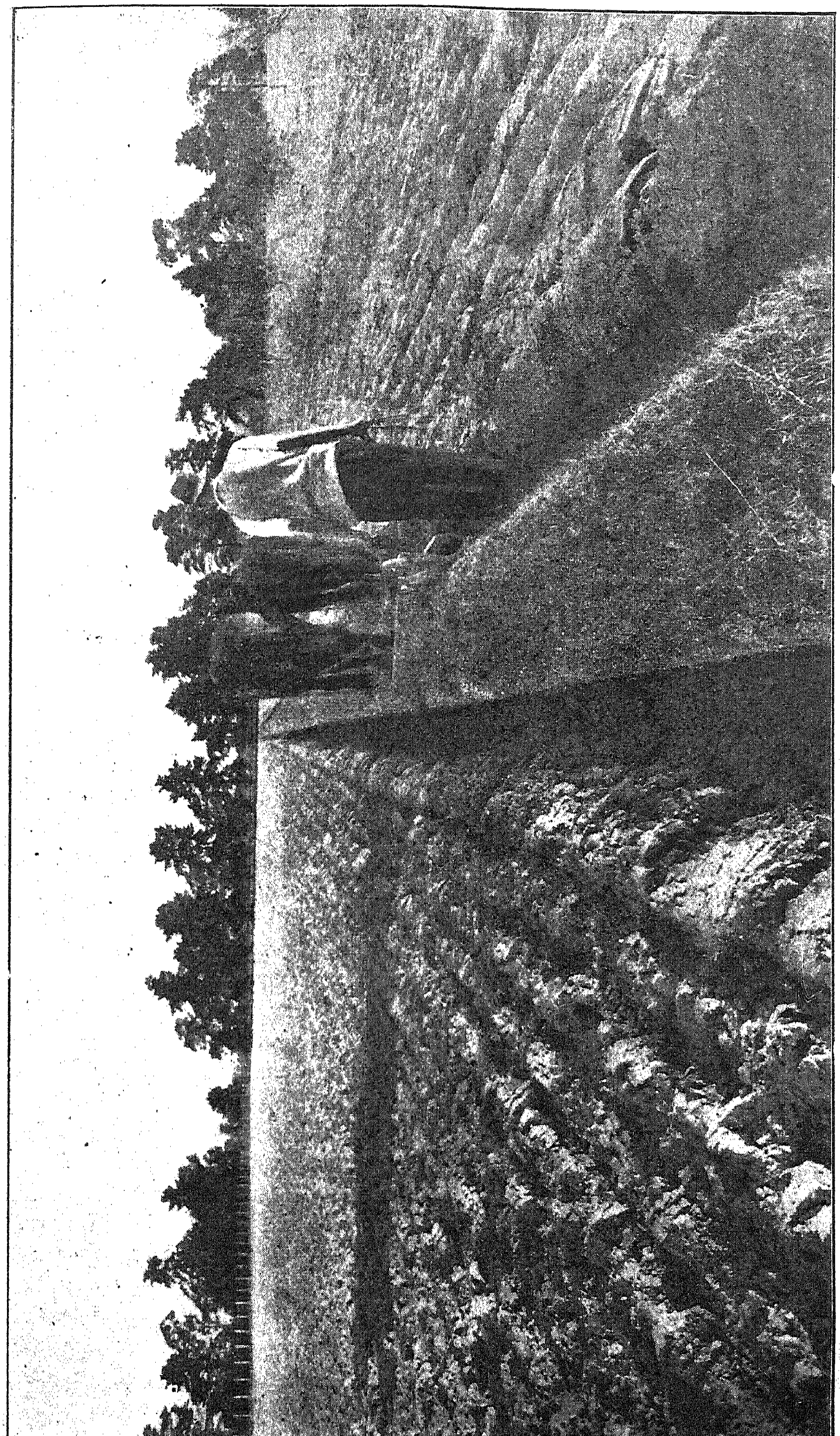


Fig. 4.—Good Ploughing—Correct Adjustment of the Plough and Skill Make such a Result Possible.
Note how the modern upright mouldboard plough successfully pulverises the soil in the furrow slice.

[*Photo by A. C. T. Kellick.*

or downwards. If the plough tends to run to the right, the sliding head is brought over to the right, which forces the plough in the opposite direction. In each case the adjusting is done in the opposite direction to the one it is desired the plough should go.

The natural tendency of the pivotal point (the sliding head to which the hitch is attached) to come and to stay within the true line of draught acts as the leading force in governing the depth of ploughing and the width of the furrow slice (see Fig. 3). This cannot be hampered by the improper adjustment of gauge wheels, etc., without danger of disturbing the steady running of the plough.

When learning to plough, it is better to use a swing plough, that is, one without gauge wheels for the depth and width of the furrow slice. Wheels make the work easier for the ploughman, as they steady the plough, but they tend to make a careless ploughman. The swing plough is used at Hawkesbury College with beginners. It teaches them to keep the plough balanced; they soon acquire the knack of doing this when they are able to control their horses properly.

Setting the Plough.

In the case of the swing plough, reference to Fig. 3 will show the best position as far as draught is concerned for the hitch (where the trace chains through the equaliser join the sliding head).

Efficiency of draught, however, is not the only consideration in ploughing, and the hitch must be adjusted to suit the plough, the soil, and other conditions. A share with much downward pitch will tend to go deeper than one with less. A little set to the landside is seen on a new share, and is always given when the blacksmith is repointing a used share. This tends to hold the plough into its work, that is, to the unploughed land. A good test for the satisfactory running of a plough is to let go the handles. In level land, when the soil is even in texture, the plough should hold up to the furrow slice steadily from one headland to the other. If it does not, it is not set satisfactorily. This is a rather severe test for most ploughs met with in this country. If the plough runs too deeply it may be due to too much downward pitch on the point of the share; or the adjustable stay in the vertical clevis may need lowering or the trace chains shortening. Any or all of these adjustments may be required. If the plough runs too shallow, raise the adjustable stay in the vertical clevis, lengthen the trace chains, see that there is sufficient suction on the share. If these adjustments are all made satisfactorily, the rear of the landside (or heel plate if one is fitted to the plough) should ride firmly on the bottom of the furrow.

Attention should always be given to the traces and swingle bars. The length of trace should be governed by the height and not by the length of the horses. The necessary adjustments of the hitch in the vertical clevis should be made by raising or lowering the hitch to suit the height of the horses. Traces also should be made long or short to suit the team. If too short, no swing plough will run steadily.

The lengths of the equaliser and swingle-bars must receive attention. If horses are working wide apart, the plough will tend to cut a wide furrow and, conversely, if working close together a narrow furrow. For the ordinary width of furrow, measuring up to about 12 inches wide, an equaliser 3 feet long is satisfactory. If a wider cut is made, the equaliser should be 3 feet 6 inches long. With these adjustments, the hitch on the cross clevis will be about the centre, and the centre of the swingle-bar on the furrow horse will be in the middle of the furrow.

In conclusion, a knowledge of the principles involved in ploughing and practice with a single-furrow swing plough will enable improvement to be made rapidly in the art of ploughing. Good ploughing means easier work for horses and ploughman and the satisfaction, pleasure, and pride that come from work well done.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th June, 1933:—

Description.	Imports.	Exports.
Interstate.	Cases.	Cases.
Fresh Fruit ..	509,149	75,933
Tomatoes ...	79,853	...
Bananas	12,182	30,553
Pines	31,497	1,665
	lb.	lb.
Canned Fruit ..	472,500	18,032
Dried Fruits—		
Unspecified ...	4,312	224
Currants ..	3,948	...
Raisins ..	3,864	...
Apples ...	1,064	...
Apricots ...	1,484	...
Prunes ...	336	14,190
Pears	336	...
Peaches ..	280	...

Description.	Country of Origin.	Imports.	Exports
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	85,710
Bananas ...	....	6,609	...
Lemons ...	....	167	2,602
Oranges ..	....	48	14,734
Grape Fruit ...	....	105	...
Pears	....	...	3,479
Other	....	69	4,829
Dried Fruits—		lb.	lb.
Apples ...	....	...	1,756
Apricots ...	....	...	11,358
Currants ..	....	..	65,970
Figs	....	11,436	
Peaches ...	....	...	428
Prunes ...	....	...	384,461
Raisins—			
Sultanas...	....	...	1,271,122
Lexias ...	....	...	620
Other ...	....	...	1,396
Dates	Iraq	48,142	46,641
Other	China	515	1,621
	Spain	103	...
	United Kingdom	102	...
	India	6,720	...
Preserved in liquid—			
Apricots ...	....	...	475,126
Peaches ...	....	...	2,073,972
Pears ...	....	...	110,152
Pineapples ...	....	...	85,085
Other ...	....	Gallons. 813	70,774

To Improve Our Celery.

JOHN DOUGLASS, H.DA., H.D.D., Senior Agricultural Instructor.

Celery is a rather unimportant crop in Australia, mainly because of the inferior quality of the article we produce. In most other countries, celery forms a very important part of the diet and is extensively grown.

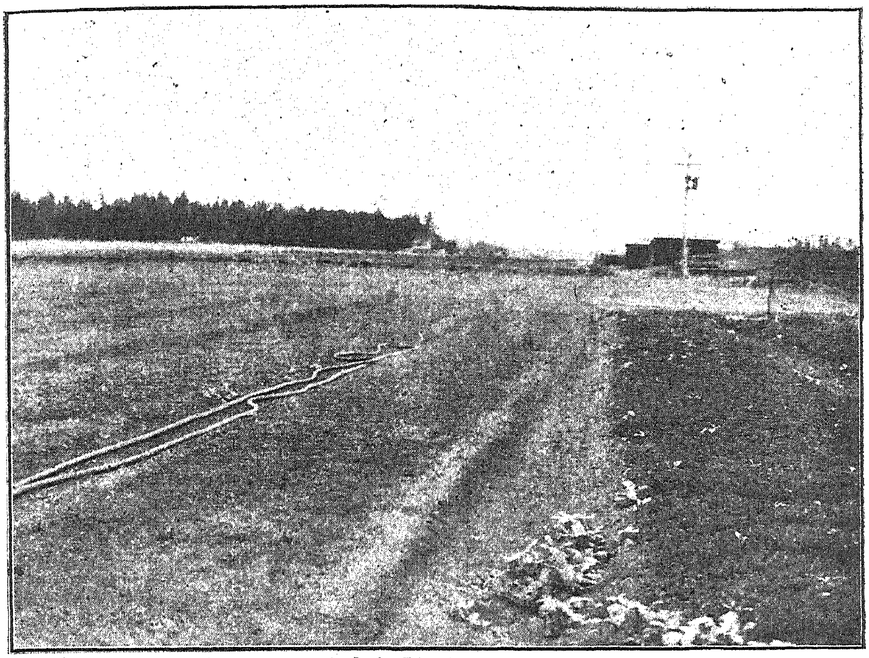
There are many reasons for the backward state of the industry in this country, particularly in New South Wales, the most important being the poor results obtained from imported seed (on which most growers rely) and the failure of the average grower to give the necessary attention to details in cultivation and marketing that the crop requires.

THE importation in recent years of considerable quantities of celery from South Australia has brought this crop prominently under the notice of New South Wales consumers and growers. While the South Australian product is much superior to any celery that has been seen on the Sydney market previously, generally speaking it does not come up to the quality of the articles marketed by the specialist celery growers of Canada, U.S.A., and England, to whose methods I gave special attention during my recent investigations in those countries.

When I was in the cold country around Oregon, Washington State, and western Canada, I saw celery which I thought could not be bettered. On visiting the vast celery fields on the "muck soils" of New York, however, I found even better celery, but I later learned that none of these could compare for either quality or flavour with the celery grown in England. However, I am convinced the climatic and soil conditions of parts of New South Wales are suitable for the production of celery of the highest quality. But soil and climate alone will not produce one stick of celery. It is a crop that demands special attention, and not a little outlay, although this latter item should cause intending growers no concern, as it is soon recovered by increased returns from the better quality produce.

Time of Planting is Most Important.

The time of planting is one of the most important points in celery growing. It has been proved that this factor influences quality, pithiness of the stems, and "bolting" to seed heads. Ordinarily, some difficulty is experienced in obtaining a satisfactory germination of celery seed, and in Australia, because of the poor quality of the seed used, this trouble is accentuated and often causes considerable loss to growers. Overseas growers, moreover, invariably soak or sprout the seed before sowing. They allow plenty of space between the seedlings, which are set out in the field in rows 3 to 4 feet apart, and are kept growing vigorously by inter-row cultivations about every week and side dressings of fertiliser.



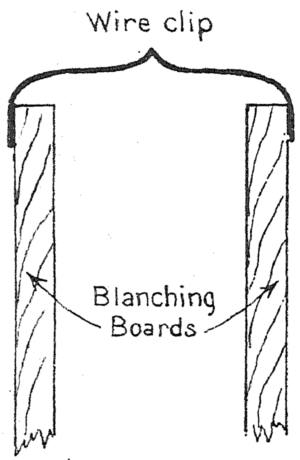
Celery Beds in Washington State, U.S.A.
The seedlings in each bed are at a different stage of growth to ensure a supply of celery over as long a period as possible.

A Celery Crop Ready for Marketing.
Note the heavy top growth, the blanching boards, and the trimmings (in left foreground) from the row already harvested.

Soil preparation in the celery beds is given every attention, the workings being deep and thorough, and even in the "muck" areas, where the soil is pure peat, very heavy applications of fertilisers (up to 3,000 lb. per acre) are given in conjunction with green manuring. Regular spraying of the plants in the seed bed for the prevention of damage by pests and diseases is always rigidly carried out.

Celery should be Properly Blanched.

Overseas celery growers impressed upon me the necessity for proper blanching. It was considered perhaps the main factor that goes to make up quality. At any rate, I was assured that poorly blanched celery did not find a ready sale.



The Americans practise many methods of blanching—with boards, paper sleeves, etc.—but none comes up the "board" method. The boards are placed on the outside of the rows, as shown in the illustration. A handy arrangement to keep these boards in position is a wire clip after the style of that figured. The boards call for a rather heavy initial outlay, but they have a long life. The method of blanching by hilling with soil is practised only with the late crop, when danger of injury by frost is likely to occur. It is an effective method, but has many defects when compared with the use of boards. In the hotter areas self-blanching varieties are grown. These pro-produce an abundance of leaves and stalks, the outside ones giving sufficient protection to blanch the inner ones.

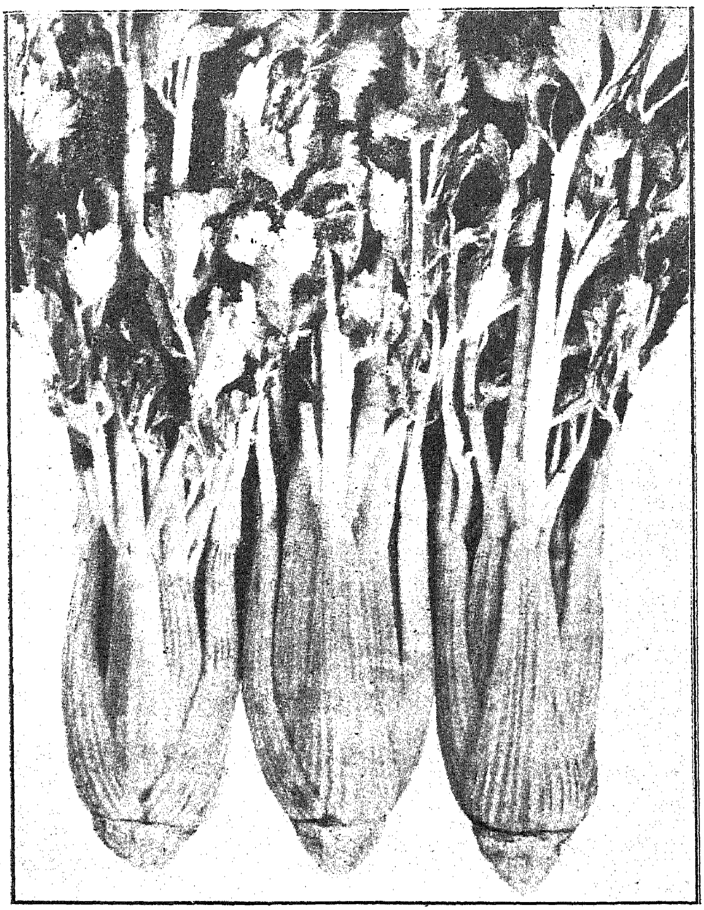
Some Hints on Marketing.

Without fear of contradiction it can be said that the Americans lead the world in the matter of get-up of produce for market; and celery is no exception to the rule. Taking the celery-growers of New York State as an example, much of their produce is marketed on co-operative lines. The crop is cut and carted to central packing sheds in rough crates, where it is graded by hand, washed by machinery, and the heads stripped of any cracked or damaged stalks. The bunches are then packed into crates of the type shown in the illustrations. It is worth noting that the celery is packed in an upright position, and this, combined with the open type of crate, allows of ample ventilation and consequently prevents heating. Furthermore, the open type of crate facilitates examination of the contents by the buyer. Another point of interest is that the roots are left on the plants when crated, as this is said to prevent drying out of the stalks and consequent lowering of quality. The bottom side boards on the crates hide the roots from view and so preserve the general appearance of the article.

Harvesting a Field of Celery in the Muck Areas of New York State.
The crop is cut by a horse-drawn implement which severs the tap roots. Note how the celery is packed into rough crates for transport to the central packing house.

Celery Crated for Market.
This is the type of crate referred to in the article. Note that the celery is transported in an upright position.

The inferior grades of celery are not wasted. Girls are employed to strip the outside stalks away until the heart alone is left. These "hearts of celery" are only about 7 inches long, but consist of the finest and most succulent blanched leaves. They are sometimes tied in bundles of three, or wrapped singly in greased or transparent (cellophane) paper, and command a very high price. Thus, what might in other countries be considered waste, is turned into a luxury.



American Self-blanching Celery.
Note the medium length of the perfectly blanched stalks. The width of the stalks denotes solid hearts.

The consuming public in countries abroad demand medium-size celery, alongside of which even our best Australian celery would be considered far too large. Apparently the impression overseas is that coarseness is always associated with grossness, and in most cases this is a fact. Other points of difference between Australian and overseas celery are that the latter is invariably more solid hearted, and the stalks are more flattened and those near the centre overlap to such an extent as to make the centre appear solid.

The Agricultural Bureau Discusses State wide Problems.

Annual Conference Held at Richmond.

The Eleventh Annual Conference of the Agricultural Bureau of New South Wales, held at Hawkesbury Agricultural College from 25th to 28th July, was a record one so far as attendance was concerned, while the addresses given and the discussions promoted by the items on the business paper were of the same high standard that usually obtains at this important function. Since the programme covered most of the important problems

Delegates Assembled to Greet the Governor (centre, front row).

facing those engaged in the various primary industries of the State, an immense amount of information was obtained by those who participated from the interchange of knowledge and viewpoints—and since the delegates represent some 8,000 of the progressive farmers and graziers of the State, to whom the information obtained at the College will be passed on in the branch meetings, the value of the conference to the State generally must ultimately be very great.

The Governor Opens the Conference.

The conference was officially opened by His Excellency the Governor, Sir Philip Game, G.B.E., K.C.B., D.S.O., who said that he was convinced that the problems facing the world to-day were undoubtedly solvable—there should be no reason why people should go short in a world of plenty. Though other measures might give temporary relief, there could be no real advance toward the removal of the economic difficulties of the world until the results of scientific research were intelligently applied. Fortunately agricultural science had made considerable advance in recent years, and the work of applying the results, which the Bureau was doing in conjunction with the Department of Agriculture, was typical of that being done in a number of Empire countries.

Many Interests Represented.

Agricultural Bureau activities cover the whole range of the interests, both economic and social, of the men and women in the rural districts of this State, and in addition to the delegates there were present at the conference to participate in the discussions many representatives of other rural organisations and of government departments, both Federal and State. Among these were the Hon. Hugh Main, M.L.A., Minister for Agriculture; Mr. M. Brown, M.L.A.; Mr. A. H. E. McDonald, Director of Agriculture; Major-General Sir Charles Rosenthal; Mr. T. W. Irish, Under Secretary for Lands; Mr. McLachlan, Deputy Chief Instructor, Department of Education; Mr. H. Rodgers, Commissioner of the Rural Bank and Director of Farm Relief; Messrs. A. G. Dennis and D. Howse, representing the Railway Department; and Mrs. W. Davis, representing the Country Women's Association.

For the success of the conference the organisers of the Bureau movement (Mr. C. C. Crane, B.A., and Miss Lorna Byrne, B.Sc.Agr., of the Department of Agriculture) were largely responsible, and a large amount of work fell on the shoulders of the convening secretary, Mr. E. J. Power, while the courtesies extended by the Principal of the College (Mr. E. H. Southee, O.B.E., M.A. (Oxon.), B.Sc., B.Sc.Agr.), and the members of his staff, did much to ensure the comfort of the delegates and the success of the gathering.

The work of the conference was conducted in general sessions (at times) and in four special sessions (for those interested in dairying, wheat and sheep farming, fruit or vegetable growing and matters of special concern to women members) on other occasions. Mr. W. W. Watson, of Parkes, General President, was in the chair throughout the general sessions, and Messrs. E. H. Filmer, of Candelo (dairying), J. T. Hawick, of Grenfell (wheat and sheep), P. T. Whiteman, of Dooralong (fruit and vegetables), and Mrs. W. W. Watson (women's) presided at the special sessions.

Hon. Hugh Main's Message.

In a brief address following the official opening the Minister for Agriculture (Hon. Hugh Main, M.L.A.) emphasised to delegates that farmers must

depend on themselves if they were to succeed, and unless they were prepared to do so no Government could help them. This applied particularly to marketing, to which there were two aspects, viz., international and local. Mr. Main detailed the success with which Bawra had disposed of the huge surplus of wool at payable prices following the war, and suggested that the present wheat position was somewhat similar. A scheme had been proposed at the world economic conference to absorb within two years the surplus at present hanging over the buyers, and if the importing countries would co-operate this would do for wheat prices what had been done for wool prices fourteen years ago.

Local marketing was more directly under the control of the growers, but there was great disparity between the return to the unorganised producer (which, for example, was one-sixth of the price paid by the ultimate consumer in the case of the wheatgrower) and that obtained by the organised producer such as the dairy farmer, who even now that the price of his product had dropped, still received 50 per cent. of the ultimate price.

In conclusion Mr. Main again emphasised that marketing was a matter for the producers themselves, though it might be necessary for governments to legislate to give the producers the power to do the job.

A Well-balanced Programme.

To traverse the list of addresses given and the motions discussed would take more space than is available, but it is interesting to note that in addition to the many talks on the actual production of various products, there were a number which dealt with the economic aspects, such as those of Professor Hytten, of the Bank of New South Wales, who discussed "The World Economic Conference," and of Mr. A. H. E. McDonald, Director of Agriculture, whose address was on the world wheat position, and also quite a number which may be described as of general interest, such as the description of some of his rambles by Mr. Ion Idriess, the well-known author of *Lasseter's Last Ride* and other works, and a talk on a tour of New Zealand by Mr. R. J. Inglis, of the staff of the New Zealand Commissioner.

Items from the Business Paper.

More than forty motions concerning the affairs of primary producers were brought forward for discussion at the various sessions.

As in previous years the conference expressed the opinion that a Federal compulsory wheat pool under growers control was the only means, under present conditions, of guaranteeing the farmers a fair margin of profit, and a resolution was carried asking the Federal Government to enact legislation to provide for the formation of Federal marketing boards.

Dairymen protested against the system of extracting cream from milk offered for sale, and representations are to be made to a number of Government departments for reductions in charges to enable the producer to gain a greater return for his labours.

A more detailed report of the proceedings of the conference has already been published in the August issue of the *Agricultural Bureau Record*, the official monthly journal of the movement.

Debates and Social Activities.

Debates now form a very definite part of the work of Bureau branches with the object of teaching the members to give coherent expression to their ideas and to widen their knowledge, and it was fitting that two debates should be staged at the State Conference. In one case a Bureau team was matched against a team of women from the United Associations, and the resultant debate was designated by Mr. J. Herlihy, who adjudicated, as being of as high a standard as any in which he had officiated.

The social side of life in the country is an aspect to which Bureau members have devoted considerable attention in recent years, and not the least valuable feature of the conference was the making of new and the renewal of old friendships with fellow producers from other districts during the four days the delegates were lodged at the College, while the devoting of one evening session to a dance and social evening provided for complete relaxation.

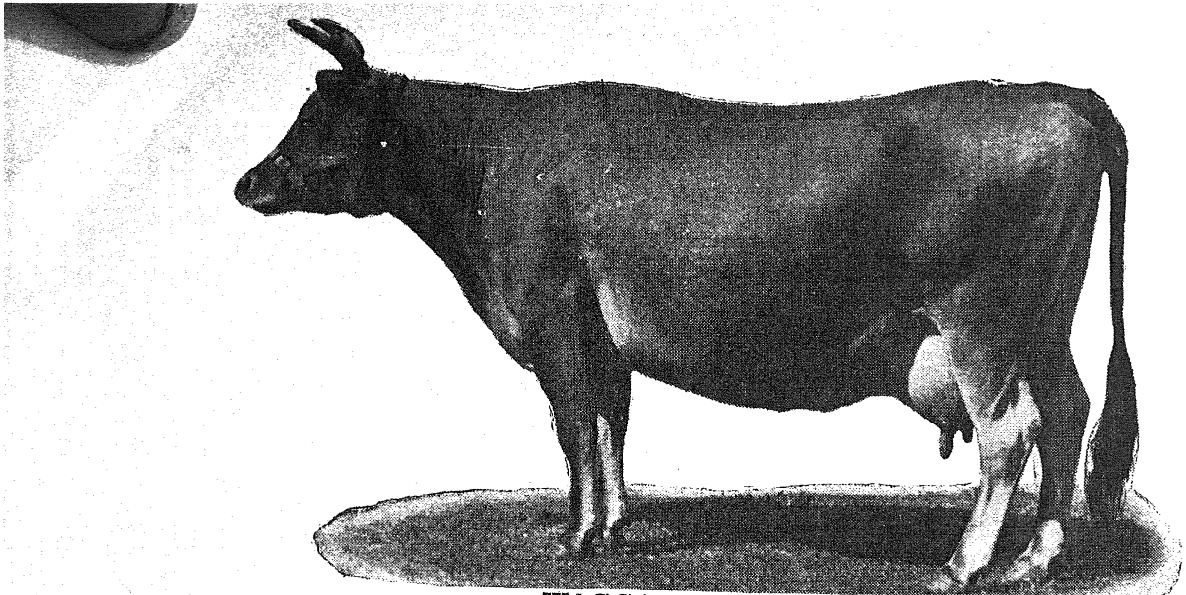
Officials and Functions for the Coming Year.

Mr. W. W. Watson, of Parkes, was re-elected, unopposed, as general president for the ensuing year.

Advisory councillors, district officials and dates of district conferences for the coming year are shown in the following table:—

District.	Advisory Councillor.	District President.	District Secretary.	Conference.	
				Place.	Date.
Upper North Coast ...	H. J. Bakewell	G. W. Young...	H. J. Bakewell	Taree	16th, 17th November.
Hunter River	A. S. Pankhurst.	A. S. Pankhurst.	H. R. Collins ..	Maitland ...	2nd week April.
Central Coast	P. T. Whiteman.	J. Byrne ...	P. T. Whiteman.	Botanic Gardens, Sydney.	Last week March.
Illawarra	A. C. Brown ..	A. C. Brown ..	F. Turnbull ...	Camden ...	29th, 30th September.
South Coast and Monaro.	E. H. Filmer...	J. J. Britten ...	H. M. Blomfield.	Bega	1st or 2nd week May.
Southern	J. Brann ...	J. Brann ...	J. G. Strauss...	Albury ...	20th, 21st, 22nd Feb.
South-western ...	J. T. Hawick ..	R. Penfold ...	A. L. Harnett..	Quandialla ...	27th, 28th Feb.
Central-western ...	G. Tanswell ...	F. B. Hinton...	J. Watson ...	Eugowra ...	14th, 15th March.
North-western ...	J. Cavanagh ..	W. O. Manning	J. Cavanagh ..	Binnaway ...	6th, 7th March.
Fruit and Vegetable Growers' Group.	J. E. Dodds ...	P. T. Whiteman.	J. E. Dodds ...	H.A.C., Richmond.	July.

The Department is always anxious to hear from individuals or bodies desirous of forming branches of the Agricultural Bureau and will be glad to supply literature explaining the movement and how a branch may be established.



WAGGA GLADYS (7778).

The following are the Herd-testing Records of some of the Cows in Departmental Herds:—

Jersey Cow: WAGGA GLADYS (7778). This cow holds a world's record for butter production for the Jersey breed—22,847 lb. milk, 1,517 lb. commercial butter in 365 days. Awarded Champion Ribbon, Peter's Prize, R. A. Show, 1928. *Guernsey Cow:* WOLLONGBAR PARSON'S RED ROSE 20th (730). Holds a world's record for butter production for the Guernsey breed—17,252.5 lb. milk, 1,302.62 lb. commercial butter in 365 days. *Ayrshire Cow:* MISS DOT OF GLEN INNES (3760)—19,562.5 lb. milk, 1,088.64 lb. commercial butter in 365 days.

The Department has for sale young bulls from tested dams of the following breeds:—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

For further particulars apply to—The UNDER SECRETARY, Department of Agriculture, SYDNEY.

Field Potato Competitions, 1932-33.

Western District Championship and Local Results.

A. C. ORMAN, Agricultural Instructor.*

THE 1932-33 potato-growing season in the western district was a most unfavourable one. Though the weather conditions up to the end of January (in which month beneficial rains were experienced) gave promise of good yields, the severe frosts and the dry and hot weather which followed resulted in an early cessation of growth and reduced yields.

Though seventy-eight entries from the four societies which conducted local competitions, viz., Oberon, Blayney, Orange and Millthorpe, were presented for preliminary judging in early February, this number was

A Crop of Satisfaction at Oberon.

reduced to fifty-one—an increase of nine over last year—at the final adjudication, mainly as the result of these unfavourable growing conditions.

The absence of rain in February and March was also responsible for heavy infestation of many of the entries with potato moth and consequent reduction in yield of marketable tubers—up to the extent of 60 per cent. in some cases. Plots sown early (in November) invariably gave higher yields than those sown in December, as they were able to make better use of the rains that fell up to the end of January. The presence of scab was almost general, and growers would be well advised to dip their seed in

* Mr. Orman judged the local and championship competitions.

corrosive sublimate before planting. The recommendations of the Department in this regard are set out in a leaflet which may be obtained free on application. Those competitors who had dipped the seed had comparatively clean crops.

The Royal Agricultural Society's Championship.

The Royal Agricultural Society again presented a silver cup for a championship competition, for which the winners of each local competition were eligible, being able to fulfil the conditions required for this contest.

Details of the awards made in the championship contest are given in the following table:—

AWARDS in District Championship Competitions.

Competitor and society.	Variety.	Rows per chain.	Yield per acre.	Points awarded.						
				Yield (5 points per ton).	Quality.		Freedom from disease.		Purity.	Total points.
					Appearance.	Cutting.	Tops.	Tubers.		
Maximum points ...	....	...	...	...	15	15	8	7	15	...
			t. cwt.							
G. L. Brien (Oberon) ...	Factor ...	33	6 2	30½	13	13	7½	6	15	85
A. G. Kingham (Blayney)	,, ...	26½	5 8	27	13½	13	7	6¼	15	81¾
Ginns Bros. (Orange) ...	Late Manhattan.	30¾	4 14	23½	13¾	13½	7¾	6½	14¾	79¾
W. Bryant (Millthorpe)...	Factor ...	26	4 5	21¼	13¼	13¼	8	6½	15	77¼

The Winning Crops.

For the first time the honour of winning the championship went to the Oberon entry—that of Mr. G. L. Brien, "Ferndale," Oberon. The crop was grown on new land, a friable loam, which was first ploughed in August. Two harrowings were given during the interval preceding planting on 22nd November. Both cut and whole seed were dropped in every second plough furrow, the rows thus being at the rate of 33 per chain. A fertiliser mixture consisting of superphosphate and blood and bone at 2½ cwt. per acre was applied with the sets. The plot was harrowed immediately following planting, and inter-row cultivations were given to control weeds and conserve moisture during the growth of the crop.

Mr. A. G. Kingham, "Athloy," Blayney, was the runner-up in the championship. His crop was grown on land that had been out to grazing since 1931. The land was first ploughed at the end of September and harrowed immediately after; cross-ploughed early in October and springtooth cultivated twice in November. Whole seed, 1½ to 3 oz. in weight,

was dropped from the plough on 30th November. A proprietary fertiliser mixture at the rate of 1½ cwt. per acre was drilled in two days before planting. The after-cultivation consisted of harrowings on 15th and 26th December, and an inter-row cultivation in mid-February.

The Oberon Competition.

ONLY five of the original twelve entries remained in at the final judging in the fourth annual potato crop competition conducted by the Oberon Agricultural Society. Growers in the Oberon district have made definite progress since the first competition in 1929, there being a marked improvement in the standard of the majority of the crops submitted this season in regard to freedom from impurities and degenerate diseases.

The average yield of the five plots was 4 tons 19 cwt., a very satisfactory figure considering the adverse season experienced. The width of planting varied from 24½ to 33 rows to the chain; past years' results have indicated that the closer the planting, provided that inter-row cultivation is still possible, the higher the yields obtained.

Details of the points awarded the winners are given in the following table:—

AWARDS (of Leading Competitors only) in the Oberon Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points awarded. Yield (5 points per ton).	Quality. Appearance.	Quality. Cutting.	Freedom from disease. Tops.	Freedom from disease. Tubers.	Purity.	Total points.
			t. cwt.							
G. L. Brien	Factor	33	6 2	30½	13	13	7½	6	15	85
F. E. Harvey ...	,, ...	26½	5 16	29	13¼	13	7½	6¼	14¾	83¾
R. H. Mackie ...	Satisfaction ...	29	5 5	26¼	13¼	12	3	5½	15	75

The Prize Winners' Crops.

Mr. G. L. Brien, of "Ferndale," Oberon, won with a crop that also won the Western District Championship. Details of this entry are given in the championship report on page 664.

Second prize was gained by Mr. F. E. Harvey, Oberon, also with a plot of Factor, the yield being 5 tons 16 cwt. per acre. The small margin of 1¼ points separated this plot from the winning one, and Mr. Harvey is to be congratulated on the fine showing he made in his first competition. The plot was planted on 3rd November on an elevated patch of new ground. The first ploughing was given on 5th August, and this was followed by a cultivating with the disc cultivator the first week of September. Whole and cut selected sets were dropped every third furrow; no fertiliser was

applied. Two harrowings were given after planting. This entry did not receive such a severe setback from the frost as did other plots, but suffered from the effects of the dry weather.

Mr. R. H. Mackie, of Gingkin, Oberon, was placed third with a plot of Satisfaction yielding 5 tons 5 cwt. per acre. This competitor is also a newcomer so far as the competition is concerned, and he should be pleased with his initial effort. The crop was grown on a friable basaltic loam which was cropped to potatoes the previous year. The first ploughing (with a mouldboard) was carried out on 26th September, and the plot was harrowed twice during the period between the first ploughing and planting. Cut and whole selected sets were dropped, without fertiliser, after a two-furrow plough on 26th September. A harrowing was given immediately after planting. The harvested tubers, though of good appearance, lost points for cutting, owing to discolouration and hollow centres.

The Blayney Competition.

THE second annual potato crop competition conducted by the Blayney A. and P. Association was divided into two sections—one each for white- and coloured-skinned varieties. At final judging there remained six entries—all of Factor—in the former with an average yield of 3 tons 8 cwt. per acre, and five entries—all of Early Manhattan—in the coloured-skinned section, in which the average yield was 3 tons 1 cwt. per acre.

The width of planting varied from 21½ to 38 rows per chain, the majority being from 24 to 28 rows per chain.

The Winning Crops.

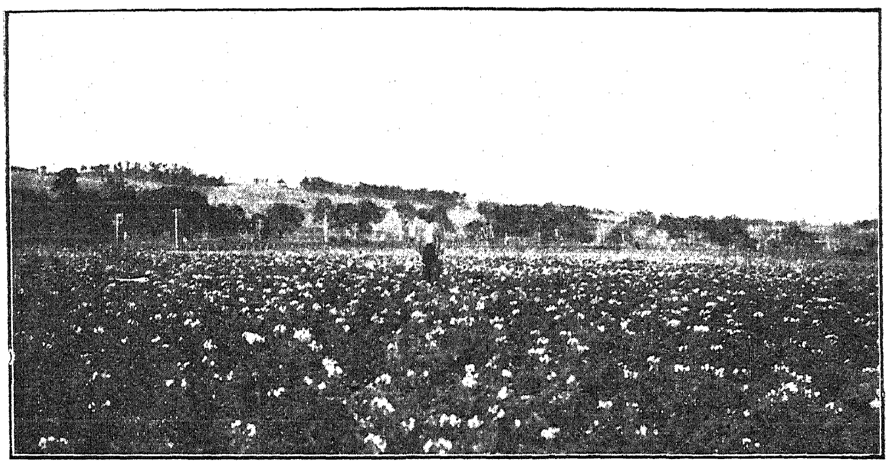
The details of the points awarded the winners are set out in the following table:—

AWARDS (of Leading Competitors only) in the Blayney Competion.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points awarded. Yield (5 points per ton).	Quality. Appearance.	Quality. Cutting.	Freedom from disease. Tops.	Freedom from disease. Tubers.	Purity.	Total points.
			t. cwt.							
			White-skinned Section.							
A. G. Kingham ...	Factor	26½	5 8	27	13½	13	7	6¼	15	81¾
W. Stonestreet ...	,, ...	28	3 18	19½	13	13¼	8	5¾	15	74½
W. Burns	,, ...	25½	3 18	19½	13	13	6½	6	15	73
			Coloured-skinned Section.							
A. G. Kingham ...	Early Manhattan	25½	3 19	19¾	14	13¾	7¾	6½	15	76¾
W. Burns	,, ...	25½	3 10	17½	13¾	14	8	6	15	74¼
W. Stonestreet ...	,, ...	27½	3 9	17¼	13½	13¾	8	6¼	14¾	73½

The winner of the white-skinned section was Mr. A. G. Kingham, Athloy, Blayney, whose crop of Factor yielded 5 tons 8 cwt. This entry was also awarded second prize in the championship competition, and details in regard to it will be found on page 664.

Second place in this section was filled by Mr. W. I. Stonestreet, of Springdale, Barry-road, Blayney, whose plot was on land that had been uncropped for many years. The first ploughing was carried out in the beginning of September, and the plot was harrowed once and springtooth cultivated during the period between the first ploughing and planting. Whole seed 2½ oz. in weight was dropped from the plough. The fertiliser consisted of 1 cwt. superphosphate per acre drilled in prior to sowing at the end of November. The plot was harrowed twice, and hilled during growth. Mr. Stonestreet was penalised to the extent of approximately 14 cwt. per acre, through not having sufficient area.



Mr. A. G. Kingham's Crop of Factor at Blayney.

In the coloured-skinned section, Mr. A. G. Kingham was also awarded first place, with a block of Early Manhattan yielding 3 tons 19 cwt. per acre. The land on which this entry was sown was prepared similarly to the Factor plot. Whole seed 1¾ to 3 oz. in weight was dropped from the plough on 26th November, the fertiliser being drilled in at the rate of 1½ cwt. per acre previous to planting. Mr. Kingham's entries benefited to some extent by isolated storms that fell in January and March.

Mr. W. Burns, "Goongirwarrie," Carcoar-road, Carcoar, occupied second place in this section. His plot of Early Manhattan was planted on 28th November on ground that had not been cropped for some years. The plot was first ploughed with the mouldboard in mid-August, and springtooth cultivated in early November. Whole sets, 2½ oz. in weight, which had been

dipped in corrosive sublimate, were dropped every third furrow. A fertiliser mixture comprising four parts superphosphate and one part sulphate of ammonia was applied at the rate of 2½ cwt. per acre. The plot was harrowed immediately after planting.

The Orange Competition.

As in previous years, the fourth annual potato crop competition conducted by the Orange A and P. Association was divided into two sections, one for white-skinned varieties and one for those with coloured skins. For final judging eight entries were submitted in the white-skinned section, the average yield being 3 tons 6 cwt. per acre, and in the coloured-skinned section there were seven entries which averaged 3 tons per acre.

The width of the rows varied from 27 to 35 rows per chain, but the majority of the competitors adopted a spacing in the vicinity of 29 rows per chain. The cutting quality of the tubers, particularly the whites, was good.

Details of the points awarded the winners are set out in the following table:—

AWARDS (of Leading Competitors only) in the Orange Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points awarded.						
				Yield (5 points per ton).	Quality.		Freedom from disease.		Purity.	Total points.
					Appearance.	Cutting.	Tops.	Tubers.		
			t. cwt.							
Coloured-skinned Section.										
Ginns Bros	Late Manhattan	30¾	4 14	23½	13¾	13½	7¾	6½	14¾	79¾
Kelly Bros.	Early Manhattan	35	3 7	16¾	13½	13½	7½	5¾	14¾	71¼
N. McClymont ...	Late Manhattan	29	2 18	14½	13½	13¾	8	5¾	14¼	69¾
White-skinned Section.										
T. E. Fuller... ...	Factor	28½	3 10	17½	13½	13	7½	6½	15	73
J. Strachan ...	"	29¼	3 12	18	13¼	13	7¼	6¼	15	72¾
Ginns Bros. ...	"	27	3 12	18	13¼	13	6	6½	15	71¾

Details of the Winning Crops.

Messrs. Ginns Bros., Huntley, Orange, with a plot of Late Manhattan were the winners of the coloured-skinned section, and gained the highest points of all entries in the competition. The plot was grown on a friable

loam that carried a crop of potatoes the previous season. The first ploughing was carried out in August, and a second ploughing followed by a harrowing was given before planting on 25th November. Selected, cut and whole seed was dropped, without fertiliser, behind the plough. The after-cultivation consisted of horse hoeing at intervals to check weed growth.

Second position in the coloured-skinned section was filled by Messrs. Kelly Bros., of Spring Terrace, with a crop of Early Manhattan. This entry was planted on new land on 19th November. The plot was prepared by ploughing early in July, and harrowing twice afterwards. A second ploughing was given before planting. Whole, selected, pit-stored seed was planted with a proprietary fertiliser mixture at 3 cwt. per acre behind a two-furrow plough, at a width equivalent to 35 rows per chain. Two harrowings were given after planting.

In the white-skinned section, Mr. T. E. Fuller, Spring Terrace, repeated his last year's performance by again winning—by the narrow margin of ½ point. Although his plot of Factor yielded slightly less than the second prize crop, the tubers were a little better in appearance, and freer from disease. Mr. Fuller's crop was grown on a basaltic loam that carried potatoes in 1931, and was fallowed last year. The first ploughing was given early in May; this was followed by a harrowing, and the block was ploughed a second time early in October, and harrowed afterwards. Whole seed averaging about 2½ oz. in weight, was planted off the plough on 20th November. Superphosphate at 4 cwt. per acre was applied. The plot was harrowed immediately after planting and again when the potatoes were well above the ground. An inter-row cultivation was given at a later date.

Second place in this section was awarded to Mr. J. Strachan, Spring Terrace, with a plot of Factor grown on land that had carried potatoes the previous season, first ploughed in early August, harrowed three times and ploughed once between this time and planting on 7th December. Cut, fork selected seed was dropped from the double-furrow plough, blood and bone fertiliser at 6 cwt. per acre being applied at planting. The after-cultivation consisted of harrowing immediately after planting and twice later during growth. The plot was hand hoed also.

The Millthorpe Competition.

For this year's competition the Millthorpe A.H. and P. Association made two sections, one for white-skinned varieties and one for Early Manhattans. Twenty of the original twenty-three entries were submitted for final judging (three Early Manhattan entries having been withdrawn), thirteen entries of Factor comprising the white-skinned section.

The Factor entries gave an average yield of 3 tons 4 cwt. per acre and the Early Manhattans 2 tons 19 cwt., the whole twenty plots averaging 3 tons 2 cwt. per acre. The width of spacing between rows varied from 22 to 28½ to the chain, though the majority of the competitors adopted a spacing of 26 to 28 rows to the chain.

Details of the points awarded the winners are given in the following table:—

AWARDS (of Leading Competitors only) in the Millthorpe Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points awarded. Yield (5 points per ton).	Quality. Appearance.	Quality. Cutting.	Freedom from disease. Tops.	Freedom from disease. Tubers.	Purity.	Total points.
			t. cwt.							
White-skinned Section.										
W. Bryant	Factor	26	4 5	21¼	13¼	13¼	8	6½	15	77¼
A. G. Kingham ...	,, ...	26½	4 7	21¾	13	13	7½	6½	15	76¾
P. A. Kingham ...	,, ...	28¼	4 6	21½	13¼	13¼	7½	6¼	15	76¾
Early Manhattan Section.										
A. G. Kingham ...	Early Manhattan	26½	3 18	19½	14	14	7½	6¼	15	76¼
P. A. Kingham ...	,, ...	28½	3 16	19	13¾	13¾	6¾	6¼	15	74½
W. Bryant	,, ...	26½	3 1	15¼	13¼	13¾	8	6¼	15	71½

Notes on the Winners' Crops.

Mr. W. A. Bryant, the winner of the white-skinned section, gained the highest points in the competition. The plot was located on a piece of land that had been uncropped for some years. The first ploughing was carried

Another Excellent Crop of Factor, that of Mr. W. Bryant, Millthorpe.

out in the second week of March; the plot was then allowed to remain in the ploughed state until mid-September, when it was ploughed again, and a harrowing was given before planting on 24th November. Medium-sized

sets, previously dipped in formalin, were dropped off the plough. A proprietary fertiliser mixture at 2½ cwt. per acre was drilled in prior to planting, and the plot was harrowed after sowing, and inter-row cultivated once during the growth of the plants.

Mr. P. A. Kingham, of The Wattles, Millthorpe, who tied with Mr. A. G. Kingham, of Athloy, Blayney, for second place in this section, planted his plot on new ground on 28th November. The first ploughing was carried out at the end of August; between this time and planting, the plot was harrowed twice, disc harrowed, and springtooth cultivated. Selected cut seed was dropped off the plough. A proprietary fertiliser was drilled in at 180 lb. per acre before sowing. The plot was harrowed twice after planting.

Mr. A. G. Kingham's entry in this section was on similar land and received similar treatment to the plot which won the Blayney contest and was awarded second place in the championship, details of which are given on page 664.

Mr. A. G. Kingham also gained first place in the Early Manhattan section. This plot was planted on 26th November on ground that received similar preparation to his Factor plot. Whole seed, 1¼ to 3 oz. in weight, was dropped from the plough, the fertiliser as in the case of the Factor plot, being drilled in prior to planting at 1½ cwt. per acre. The plot was harrowed after planting on 14th December, and again on 26th December. An inter-row cultivation was given early in February.

Second place in this section was gained by Mr. P. A. Kingham, The Wattles, Millthorpe. This entry was planted on 28th November, on new land similar to that of the Factor plot of this competitor, and prepared in the same manner. Whole seed, 3 oz. in weight, was dropped off the plough, the fertiliser consisting of a proprietary mixture drilled in at 180 lb. per acre two days before sowing. The area was harrowed twice after planting.

How to Grow the Egg Plant.

The cultivation of the egg plant is very similar to that of the tomato. The plant is susceptible to frosts, and therefore should not be planted until late spring in frosty areas. The seed is sown in boxes, and when of sufficient size the plants are transplanted 2½ to 3 feet apart in rows 3 feet apart. It is not advisable to allow too many fruit to form on the plant at once. By pinching off the extremities of the branches, bigger fruit is obtained. Superphosphate at 3 to 4 cwt. per acre applied at transplanting time should give beneficial results. On the North Coast, where little frost is experienced, this crop may be planted early. New York Purple is a common variety grown.

Up till now the demand for this vegetable has not been very great, but it is considered that it has considerable promise. The best method of forwarding may be to pack the fruits in a bushel case. It is advisable to cut them with the stalk on and grade them. If of sufficient size the fruits may be packed in a case similar to a banana case.—A. C. Orman, Agricultural Instructor.

Tobacco Notes for September.

C. J. TREGENNA, Tobacco Expert.

The Industry in 1932–33.

LOOKING back over the tobacco-growing industry for the last twelve months, it is pleasing to note the increasing realisation among old, new, and prospective growers that it is necessary in order to produce leaf of the right type to use light, sandy soils. In the far northern portion of the State, where new growers are utilising the light granitic and trap soils, excellent quality light-coloured leaf has been produced. This tobacco has found a ready market. On the other hand, much of the leaf grown on rich, fertile soils during the 1931-32 season still remains on the hands of growers, and the chances of disposing of it are not at all promising, unless the smoking public changes its taste. As that is very unlikely to happen, it seems reasonable to expect that much of this latter type of soil will eventually revert to other and more profitable forms of cropping, while the lighter soils should from now onwards be able to supply a reasonable proportion of the local requirements of light-coloured, mild-flavoured tobacco.

To Prevent Blue Mould Disease.

Blue mould disease was prevalent in all districts of the State last season, and the use of clean imported seed—put forward in some quarters as a factor in the control of this trouble—proved of no avail.

Blue mould is essentially a disease of young plants in the seed-bed, and methods employed must aim at preventing conditions favourable to its development. These may be summarised as follows:—

1. Prepare a number of seed-beds, suitably manured, so that the young plants may quickly become established.
2. Sow these beds at intervals of two or three weeks. Use seed from healthy crops.
3. Do not over-water the young plants; excessive moisture favours the disease.
4. Conserve heat, as a temperature below 45 deg. Fahr. favours the disease. Experiments conducted by the Department during a number of years indicate that if the temperature of the seedlings is not allowed to fall below 45 deg. Fahr., and the surrounding atmosphere is not allowed to become humid, blue mould does not make its appearance.
5. Allow the young plants plenty of air and sunlight.
6. Transplant at the earliest opportunity.
7. If the disease makes its appearance in any one of the beds, pull up and burn the infected plants immediately, and spray the remainder with Bordeaux mixture (2-2-50).

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Early Clarence ...	... Butler Bros., Bombowlee, Tumut.
Fitzroy	... Manager, Experiment Farm, Grafton.
Funk's Yellow Dent	... J. A. L. Thompson. "Deep Water," South Gundagai.
	T. O. Quin, "Mildura," George's Plains, *via* Bathurst.
Golden Glow ...	... G. Coleman, Ben Lomond.
Wellingrove ...	... Manager, New England Experiment Farm, Glen Innes.

Sorghum—

Cowper	... Principal, Hawkesbury Agricultural College, Richmond.
Oxley	... Manager, New England Experiment Farm, Glen Innes.
White African ...	... Manager, Wollongbar Experiment Farm, Lismore.
Sudan Grass ...	... F. and H. Owen, "Applegrove," Dun.

Potato ("Certified" and "Standard" Seed)—

Carman	... Secretary, Potato Growers' Association, Bannister (Crookwell district).
	Secretary, Potato Growers' Association, Millthorpe.
Early Carman ...	... Secretary, Potato Growers' Association, Millthorpe.
Early Manhattan	... Secretary, Potato Growers' Association, Millthorpe.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Factor	... Secretary, Potato Growers' Association, Bannister (Crookwell district).
	Secretary, Potato Growers' Association, Millthorpe.
	Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
	Secretary, Potato Growers' Association, Taralga.
Gold Coin ...	... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Late Manhattan	... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Queen of the Valley (Standard grade only.)	... Secretary, Potato Section, Rural Co-operative Society Ltd., Batlow.

Cucumber—

Early Fortune ...	... W. Parry, Terrigal.
Crystal Apple ...	... E. F. Ritter, Wyong.

Beans—

Tweed Wonder ...	... P. Morandini, "Riviera," Bunglegumbie-road, Dubbo. W. T. Sunderland, Bunglegumbie road, Dubbo. E. S. Green, Whylandra Creek, Dubbo.

Tomato—

Improved Sunnybrook Earliana ...	... A. Sorby, Macquarie Fields.
Break-o'-Day ...	... A. Sorby, Macquarie Fields. Manager, Experiment Farm, Bathurst.
Bonny Best ...	... Manager, Experiment Farm, Bathurst. P. Morandini, "Riviera," Bunglegumbie-road, Dubbo.
Marglobe ... ... Columbia ... ... Norton	} Manager, Experiment Farm, Bathurst.

Asparagus—

Lady Washington	... Manager, Experiment Farm, Bathurst.

Melon—

Red Seeded Citron	... Principal, Hawkesbury Agricultural College, Richmond.

Squash—

Banana	... Principal, Hawkesbury Agricultural College, Richmond.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1932 budding season, trees from which should be available for planting during the 1933 planting season :—

Nurseryman.	Oranges.		Eureka. Lemon.	Marsh. Grape-fruit.	Total.
	Washington Navel.	Valencia.			
L. P. Rosen and Son, Carlingford...	4,000	4,000	1,000	1,000	10,000
T. Adamson, Ermington	1,500	1,500	500	250	3,750
A. T. Eyles, Rydalmere	2,000	1,000	...	...	3,000
H. J. Ferguson, Wyong	...	200	...	...	200

—C. G. Savage, Director of Fruit Culture.

Investigations on the Green Vegetable Bug (*Nezara viridula* Linn.).

[Concluded from page 594.]

E. H. ZECK, Assistant Entomologist.

Descriptions of the Various Stages.

IT is considered that some details of the immature and adult stages should be recorded, as growers sometimes fail to recognise the immature forms on their crops. The egg and all stages are figured on the accompanying plates.

The Adult (No. 6 on Plate 2).—The adult of the green vegetable bug is a shield-shaped insect, about $\frac{5}{8}$th inch in length, and usually of a uniform light green colour.

At the sides of the head are to be seen the dark brown, compound eyes, and on the top of the head the two minute ocelli or simple eyes resembling amber beads. There is usually a yellowish-coloured portion on the head just behind each eye, and three or five yellowish spots, small, but of variable size, on the front margin of the scutellum (the large, central, shield-shaped portion on the back). The scutellum also bears a small black spot in each of its front angles.

The legs and wings are well developed, and in the adult stage each antenna consists of five segments.

As previously stated, both nymphal and adult bugs feed by sucking the sap from their host plants, and this is accomplished by the aid of a beak or rostrum. The beak or rostrum is a long, segmented, tube-like structure enclosing four needle-like setae or filaments by means of which the plant tissues are punctured and the sap sucked up. If a bug is viewed from beneath, the long sucking beak may readily be seen projecting backward from the head, and with the aid of a hand lens the minute circular openings of the spiracles or breathing pores may also be seen.

Adult female bugs are usually a little larger than the males. The sexes may readily be differentiated by the formation of the tip of the abdomen (see Nos. 7 and 8 on Plate 2).

The Egg (No. 1 on Plate 1).—The egg is cylindrical, somewhat cup-shaped, flattened on top and rounded at the lower end, varying in colour from pale yellowish to reddish-brown. The top is a circular cap or lid surrounded by a series of small clubbed processes. The egg is a little higher than wide, being about 1/20th inch in height.

Nymphal Instars.—The nymphs moult or cast their skins five times before attaining the adult stage. Thus there are five instars or stages through which the young or nymphal bugs pass before reaching the sixth or mature winged stage. When moulting, the old skin splits down the dorsal median line of the thorax, and along the juncture of the head and thorax. The nymph then gradually crawls out, leaving the old cast skin or exuvium behind.

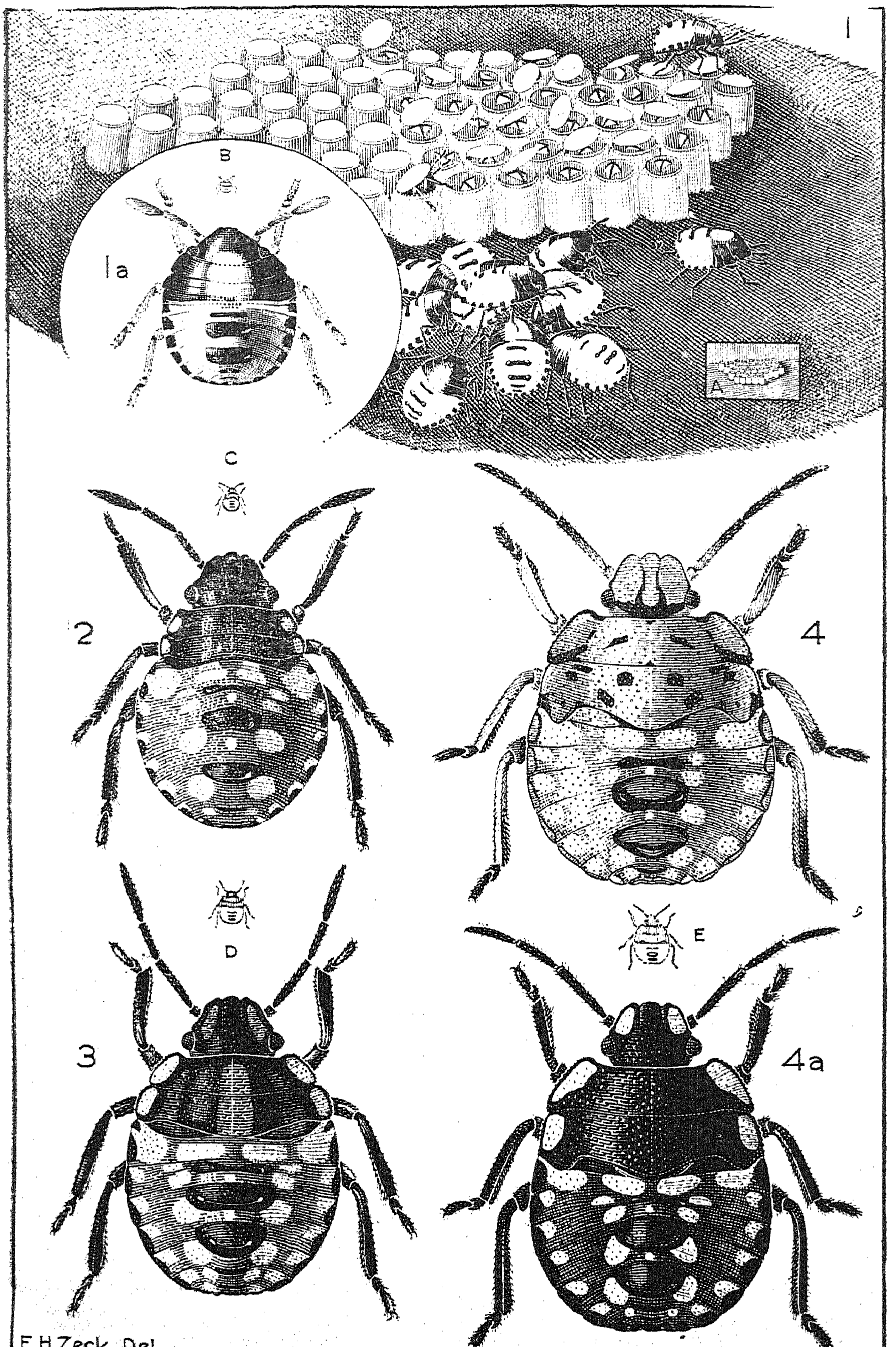


Plate 1.

1. Egg cluster and group of newly-hatched nymphs. 1a. Nymph in first instar or stage. 2. Nymph in second instar or stage. 3. Nymph in third instar or stage. 4. Nymph in fourth instar or stage, light colour form. 4a. Nymph in fourth instar or stage, dark colour form.

A, B, C, D and E indicate the actual size of the bugs.

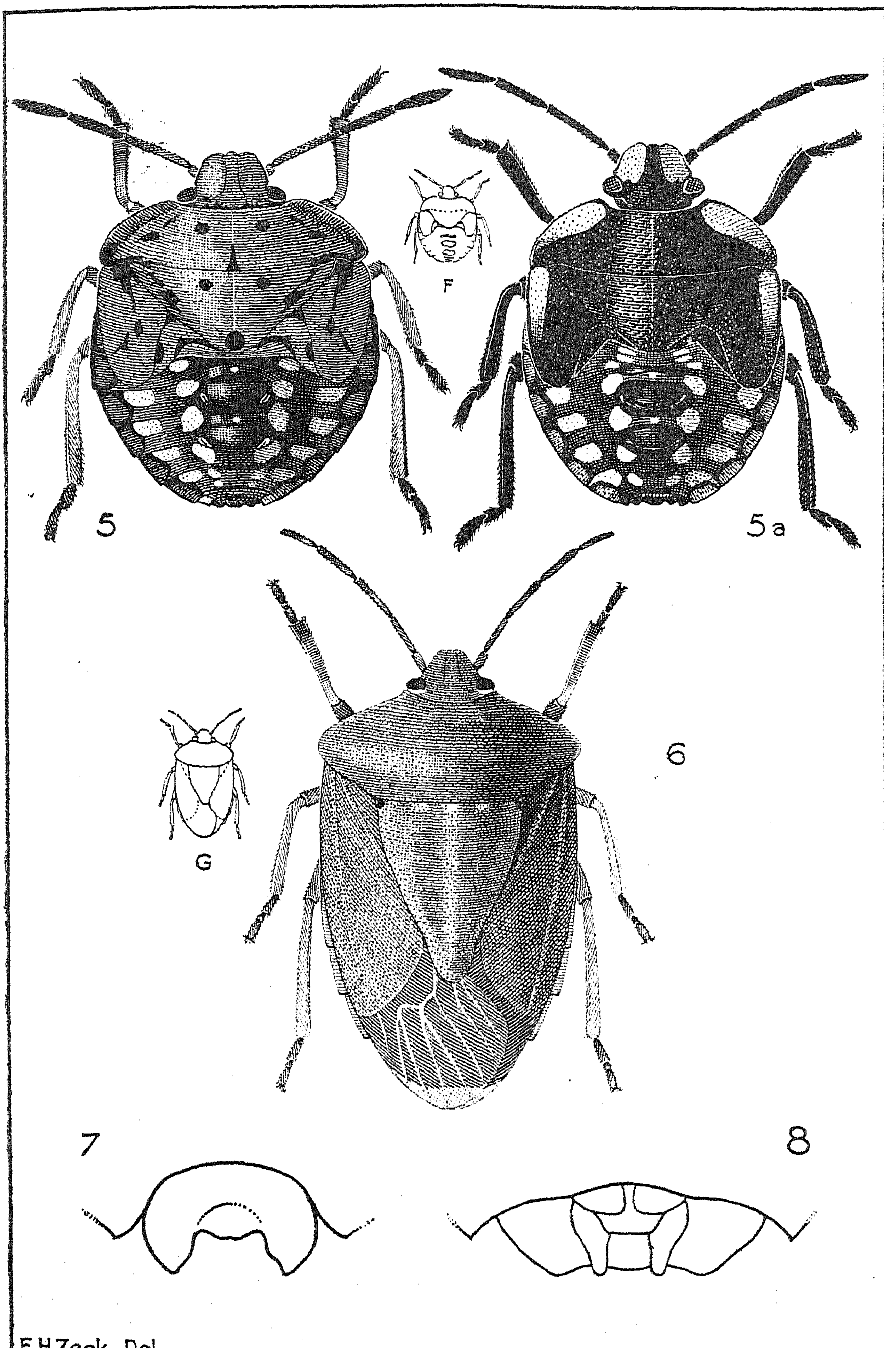


Plate 2.

5. Nymph in fifth instar or stage, light colour form. 5a. Nymph in fifth instar or stage, dark colour form. 6. Adult bug. 7. Diagram of tip of abdomen of adult male seen from below. 8. Diagram of tip of abdomen of adult female seen from below. (The setae and hairs are not shown in figures 7 and 8.) F and G indicate the actual size of the bugs.

Wings are not present in the immature stages, but the wing-buds may readily be seen in the fifth stage. Each antenna of the nymphal forms consists of four segments.

First Instar (see Nos. 1 and 1A on Plate 1).—General colour bright orange, with darker brown or crimson markings on head, thorax and abdomen. The eyes are crimson; legs, antennae, and beak brownish. Length, 1/16th inch.

Second Instar (see No. 2 on Plate 1). Head and thorax dark brown to black; two lighter spots on lateral margins of thorax. Abdomen, reddish with lighter yellowish or whitish markings. The central and lateral markings of the abdomen are black. Legs, antennae and beak black. Length, ⅛ inch.

Third Instar (see No. 3 on Plate 1).—Head black, lighter centrally; thorax black, lighter centrally and with lighter spots at lateral margins. Abdomen darker in colour than in second instar, with yellowish or whitish markings; central and lateral markings of abdomen black. Eyes and small portion at junction of antennal segments reddish. Legs, antennae and beak brown or black. Length almost 3/16th inch.

In some specimens the head and thorax are slightly greenish.

Fourth Instar.—In this instar there are two colour forms, a light form and a dark form; intermediate colour forms also occur.

Light Colour Form (see No. 4 on Plate 1).—Head and thorax pale green with black markings; lateral margins of thorax with yellowish areas. Eyes dark brown. Abdomen slightly darker green than head and thorax, and with lighter yellowish to whitish markings; central and lateral markings black; lateral markings bordering orange or yellowish areas. First segments of antennae green, second light brown, terminal two dark brown. Terminal portions of beak, and tibiae brown; tarsi brown. In some of the lighter forms a row of five median dark spots beneath the abdomen are faintly indicated.

Dark Colour Form (see No. 4A on Plate 1).—Head and thorax black; lateral markings on thorax and front of head, orange; the orange markings on the head are variable in size, and in many individuals the head is entirely black. The abdomen varies from deep red to dark brown or black; the central and lateral markings black. Antennae, legs and beak, brown or black. Eyes dark brown. There is a median row of five black spots on the under surface of the abdomen. Length about ¼th inch.

Fifth Instar.—In this instar there are two colour forms, a light form and a dark form; intermediate colour forms also occur.

Light Colour Form (see No. 5 on Plate 2).—Head, thorax and wing buds pale green with black borders; other black markings scattered over these areas. Abdomen yellowish-green to pale yellow-brown, darker towards middle and with red areas surrounded with black. Other spots yellowish to whitish. Pink areas bordered with black on lateral margins of abdomen. Antennae green, tip of third segments and two terminal segments black. Apex of beak, and tarsi black or brown; tibiae pale reddish; other portions of legs green. Eyes dark brown. Length 2/5th inch.

Dark Colour Form (See No. 5A on Plate 2).—Head and thorax black; lateral margins of thorax and lateral lobes of head, orange; the orange markings on both head and thorax are variable in size and number. Abdomen dark brown to almost black, with whitish spots and pink lateral areas as in the light form. Antennae, legs, and beak slightly darker. Abdomen beneath with a median row of five dark spots. Eyes brown. Length about 2/5th inch.

Laboratory Control Experiments.

Laboratory experiments were conducted with many substances likely to kill the bugs and the results of these are given below.

Method of Application of Sprays and Dusts.—The bugs to be sprayed or dusted were first placed in a 1/10th inch mesh gauze wire cage measuring 6 x 6 x 2½ inches high, standing upon a sheet of unglazed paper. After the application of a spray or dust, the excess material was drained or tilted off the paper, and one minute later the bugs were removed with fine-pointed forceps and placed in cardboard boxes (6 x 6 x 2½ inches) covered with wire gauze tops and supplied with bean pods for food.

The treated bugs and the control bugs (untreated) were examined twenty-four hours later; it was found that substances which had no apparent effect upon the bugs by this time failed to kill them. The sprays were applied with a hand atomizer and the dusts with a bulb blower.

As well as the upper surface of each bug, the whole of the lower surface and the spiracles thereon, were exposed to the action of the spray or dust which was applied to the bugs as they climbed on the gauze sides of the cage.

RESULTS of Spraying and Dusting Tests.

Spray or Dust Used.	Number of Bugs Sprayed.	Number Dead Twenty-four Hours Later.	Percentage Kill.
1. Miscible white oil, 1 in 40	10	0	0·00
2. Barium chloride, 1 in 70	10	0	0·00
3. Bordeaux mixture (proprietary), 1 lb. to 10 gal., plus nicotine sulphate, 1 in 400	10	0	0·00
4. Carbon tetrachloride emulsion, 1 in 25 (resin fish-oil emulsifier)	12	0	0·00
5. Cedar oil emulsion, 1 in 10 (fish-oil cresol soap emulsifier)	10	0	0·00
6. Soft soap emulsion (proprietary) 1 in 10	10	3	30·00
7. Creosote oil emulsion, 1 in 200 (fish-oil cresol soap emulsifier)...	10	0	0·00
8. Fish-oil soap, 1 lb. to 6 gal.	12	0	0·00
9. Proprietary spray (A), 1 in 10	12	0	0·00
10. Japanese proprietary mixture, 1 lb. to 30 gal., plus soap 2 lb.	14	1	7·14
11. Proprietary spray (B), 3½ oz. to 5 gal.	10	0	0·00
12. Kerosene emulsion, 1 in 10 (1 lb. hard soap to 10 gal. of mixture)	21	5	23·80

RESULTS of Spraying and Dusting Tests—*continued.*

Spray or Dust Used.	Number of Bugs Sprayed.	Number Dead Twenty-four Hours Later.	Percentage Kill.
13. Kerosene emulsion, 1 in 20 (½ lb. hard soap to 10 gal. of mixture)	14	1	7·14
14. Kerosene emulsion, 1 in 30 (5⅓ oz. hard soap to 10 gal. of mixture)	16	1	6·25
15. Kerosene emulsion, 1 in 20, plus carbon tetrachloride, 1 in 400 (½ lb. hard soap to 10 gal. of mixture) ...	17	0	0·00
16. Kerosene emulsion, 1 in 20, plus nitro-benzene, 1 in 400 (½ lb. hard soap to 10 gal. of mixture)	15	1	6·66
17. Kerosene emulsion, 1 in 10 (fish-oil cresol soap, 10 per cent.)	12	1	8·33
18. Nicotine sulphate, 1 in 25, plus hard soap, 1 lb. to 25 gal. of mixture	12	8	66·66
19. Nicotine sulphate, 1 in 50, plus hard soap, 1 lb. to 25 gal. of mixture	12	5	41·66
20. Nicotine sulphate, 1 in 100, plus hard soap, 1 lb. to 25 gal. of mixture	12	8	66·66
21. Nicotine sulphate, 1 in 200, plus hard soap, 1 lb. to 25 gal. of mixture	12	1	8·33
22. Nicotine sulphate, 1 in 300, plus hard soap, 1 lb. to 25 gal. of mixture	12	4	33·33
23. Oleum picis rect. emulsion (oil of tar), 1 in 10 (fish-oil cresol soap emulsifier)	12	0	0·00
24. Paraffin (liquid) emulsion, 1 in 10 (fish-oil cresol soap emulsifier)...	10	1	10·00
25. Petroleum soap emulsion, 1 in 20	10	6	60·00
26. Pyrethrum liquid, 1 in 500...	12	0	0·00
27. Pyrethrum liquid, 1 in 500, plus nicotine sulphate, 1 in 500 (no soap)	12	0	0·00
28. Resin soda-fish oil (resin 10 lb., caustic soda, 3 lb., fish-oil 1½ lb., water 40 gal.)	26	17	65·38
29. Resin soda-fish oil (as above) in water, 60 gal.	21	15	71·42
30. Resin soda (resin 16 lb., caustic soda 5 lb., soap 6 lb., water 100 gal.), plus kerosene emulsion, 1 in 20, equal parts	10	1	10·00
31. Resin soda-fish oil (resin 10 lb., caustic soda 3 lb., fish-oil 1½ lb., water 40 gal.), plus kerosene emulsion, 1 in 20, equal parts	10	3	30·00
32. Resin alkali solution (resin 16 lb., sodium carbonate 8 lb., potassium chloride 11 oz., soap 6 lb., water 100 gal.)...	10	2	20·00
33. Emulsified vegetable oil, 1 in 10	9	1	11·11
34. Emulsified vegetable oil, 1 in 20	10	0	0·00
35. Emulsified vegetable oil, 1 in 30	10	0	0·00
36. Sodium carbonate, 1½ lb. to 4 gal. water	12	3	25·00
37. Sodium carbonate (1½ lb. to 4 gal.), plus nicotine sulphate, 1 in 400	12	1	8·33
38. Tar distillate, 1 in 100	14	0	0·00
39. Turpentine emulsion (vegetable), 1 in 10 (fish-oil cresol soap emulsifier)	10	2	20·00
40. Pyrethrum dust	16	8	50·00
41. Nicotine dust, 2½ per cent.	10	3	30·00
42. Nicotine dust, 2½ per cent., plus pyrethrum dust, equal parts	10	4	40·00
43. Proprietary dust	10	1	10·00
44. Sodium silico fluoride, plus hydrated lime, 1 in 5 ...	12	4	33·33
45. Controls untreated (combined)	162	4	2·46

It will be seen from the above series of tests carried out with various substances that the adult bugs are extremely difficult to kill with contact insecticides, and that many often-used treatments are quite ineffective.

Although the highest percentage kill was obtained with resin-soda mixtures, these substances could not safely be recommended for delicate foliage. Resin soda-fish oil and kerosene emulsion 1 in 10, both caused damage to bean plants.

Nicotine sulphate used at a strength necessary to give a kill would be too expensive to use on a large scale.

Pyrethrum dust and pyrethrum dust mixed with an equal quantity of 2½ per cent. nicotine dust have shown the most promising results so far.

Control Measures Recommended.

Clean cultivation is an important factor in the control of green vegetable bugs, and as they congregate amongst the leaves of old bean and tomato plants, etc., which have ceased to bear, the destruction of these plants, together with the bugs thereon, would prevent increase and reinfestation by the bugs. Destroy, in particular, the remains of later crops to kill bugs which overwinter in these, and lay eggs in the spring. On the old plants a spray of pure kerosene may be used to kill both nymphs and adults in autumn and winter.

During summer the infestation can be greatly reduced if the egg clusters (readily seen upon the foliage) are collected and destroyed. A watch should be kept for the first appearance of the bugs, early in the season, from about the middle of September, and hand collecting or control dusting undertaken as soon as possible.

Pyrethrum dust or pyrethrum dust mixed with an equal quantity of 2½ per cent. nicotine dust, applied to the foliage with a small dust gun, kill some of the adult bugs and act for a time as a deterrent.

It is recommended that the dust be liberally applied to the plants, then on to the surface of the soil to dust any bugs which have dropped to the ground.

Few sprays were found effective except at prohibitive cost or risk of serious damage.

Summary.

The green vegetable bug is a cosmopolitan insect first recorded as a pest in New South Wales in 1916, at which time it appeared mainly in the county of Cumberland. It has now been recorded as a pest over an area of approximately 50,000 square miles in this State.

The bug is mainly a pest of beans and tomatoes, and as both nymphs and adults obtain food by sucking the plant juices, stomach poisons applied to the surfaces of the plants are ineffective, and contact dusts or sprays are necessary.

Observations and experiments were conducted upon the life history.

The first eggs are laid about the middle of September, by females which have overwintered as adults. Egg-laying is continued by successive generations until the end of April.

The eggs are deposited in clusters, each containing an average of fifty-seven individual eggs, which hatch in from five to eight days.

An individual female may lay as many as four clusters of eggs.

The nymphs pass through five instars or stages before reaching the adult or winged stage.

The period occupied from egg to adult averages forty days.

The shortest period of time between reaching the adult stage and egg-laying is thirty-nine days, the longest eighty-one days.

No parasites have yet been recorded attacking either the eggs, nymphs, or adult stages of this bug in New South Wales.

Control measures consist of clean cultivation and the destruction of old bean and tomato plants, etc., in which the bugs increase and overwinter.

The use of pyrethrum dust, or pyrethrum dust mixed with an equal quantity of 2½ per cent. nicotine dust, affords some measure of control.

Control experiments demonstrated that the adult bugs are extremely difficult to kill with contact insecticides.

REFERENCES.

(1) FROGGATT, W. W.—
1916. The Tomato and Bean Bug. *Agric. Gaz. N.S.W.*, xxvii, pp. 649–650.

(2) NEWMAN, L. J.—
1926. The Green Tomato Bug. *Jl. Dept. Agric. W. Aust.*, 2nd ser., iii, pp. 68–75.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Gosford	Sept. 1, 2	Hillston	Sept. 27, 28
Forbes (E. A. Austin)	,, 5, 6	Berrigan	,, 28
Murrumburrah (W. Worner)	,, 5, 6	Hay	,, 28, 29
Ungarie (D. R. Bedford)	,, 6	Hall (F.C.T.)	,, 29, 30
Singleton (J. T. McMahon)	,, 6 to 8	Narrandera (J. D. Newth)	Oct. 3, 4
Boorowa (S. G. Hughston	,, 7, 8	Deniliquin (P. Fagan)	,, 4
Galston (W. J. Hayes)	,, 8, 9	Walbundrie (H. G. Collins)	,, 4
Cowra (E. P. Todhunter)	,, 12, 13	Ardlethan (L. Smith)	,, 4
West Wyalong (J. A. Smith)	,, 12, 13	Bribbaree (J. Ashton)	,, 4
Barmedman (S. S. Penberthy)	,, 16	Leeton (E. C. Tweedie)	,, 10, 11
Canowindra (W. E. Frost)	,, 19, 20	Corowa (H. G. Norton)	,, 10, 11
Temora (J. M. McInnes)	,, 19 to 21	Ariah Park (M. Collins)	,, 11
Lockhart	,, 21	Carcoar (T. G. Stammers)	,, 11
Barellan (W. H. McRae)	,, 27	Griffith (M. E. Sellin)	,, 17, 18
Eugowra (R. K. Douglas)	,, 27	Millthorpe	,, 17, 18
Quandialla (Stuart Tomkins)	,, 27	Cootamundra (G. B. Black)	,, 24, 25

1934.

Inverell (E. A. Clarke)	Feb. 20, 21, 22	Queanbeyan	Mar 2, 3
Newcastle (P. G. Legse)	,, 21 to 24	Goulburn	,, 15, 16, 17
Moruya (H. P. Jeffrey)	,, 28, Mar. 1	Gloucester	Mar. 20, 21
Maitland (Montie Brown)	,, 28, Mar. 1, 2, 3	Kempsey	April 11, 12, 13
		Dungog (W. H Green)	,, 19, 20, 21

Removing Bordeaux Spray From Oranges.

Immersion in Hydrochloric Acid Proved Efficient and Economical.

R. J. BENTON, Special Fruit Instructor, and T. N. POWELL, Fruit Inspector.

For the control of black spot of Valencia oranges it is necessary to make applications of Bordeaux-oil (6-4-80-½) spray at blossoming time and some weeks later, and since this period normally occurs before the mature fruit crop is picked, this fruit becomes coated with spray deposit, which must be removed before the fruit is marketed.

To those growers whose oranges are marketed through a packing house which uses a washing plant, the problem presents no difficulties, but to most coastal growers who pack their own fruit and who usually brush the dry deposit from the oranges—a tedious and laborious task—the following results of trials, which demonstrate that sprayed fruit can be quickly and very effectively cleaned by immersion in certain dilute acid solutions without damage, will be of particular interest.

So tedious is the work involved in the wiping of oranges to remove the deposit of Bordeaux-oil sprays—applied to the trees to control black spot in the subsequent crop (which usually sets before the harvesting of the main crop)—that some growers undesirably delay the making of the application, with the result that the spraying is not carried out at the effective period.

With the object of determining whether this deposit could be effectively removed more rapidly and with less labour than brushing or wiping involves, tests were inaugurated about twelve months ago by officers of the Biological Branch to ascertain the efficiency for this purpose of immersion in 1 per cent. solutions of hydrochloric, acetic, lactic, citric and tartaric acids. It was found that each of these readily removed the discolouration caused by the Bordeaux.

Hydrochloric acid (also known as muriatic acid or spirits of salts) proved the most satisfactory and economical solvent of the Bordeaux spray deposit, and recently further tests were made with concentrations of 2 per cent., 1 per cent., ½ per cent., ¼ per cent., and ⅛ per cent. of this acid, the oranges used being Late Valencias, which had been well sprayed twice with Bordeaux-oil (6-4-80-½) and supplied by Mr. W. Barrett, junior, of Dooralong. The Chief Chemist of the Department also co-operated in this work.

The treatments given consisted of placing the oranges in a piece of thin hessian, submerging them in the diluted acid solution for various periods up to sixty seconds, and then plunging for an instant into clean water.

Where the immersion was for thirty seconds the spray deposit was completely removed by each solution (even ⅛ per cent.), and seven and a half seconds in a 2 per cent. solution was also satisfactory. When dry, the fruit was a very bright orange colour.

To test the effect of the treatment the fruit was stored for three weeks (in December), and each lot was then carefully inspected, but in no instance was any injury apparent from the treatment given.

In addition to hydrochloric acid alone, a number of tests were also made in which the fruit was also dipped in a 1 per cent. solution of sodium sulphate or of sodium chloride, but practically no difference was apparent as the result; odd lots of fruit treated with sodium sulphate (in particular) were possibly slightly dull in comparison with fruit treated with hydrochloric acid alone.

The strength of hydrochloric acid sold commercially requires 45 fluid ounces (2¼ pints) to 10 gallons of water to make a solution of 1 per cent. and the price is between 5s. and 6s. per gallon, plus the cost of a container.

From these results growers will see that an efficient, quick and economical method of removing the deposit is available. It is recommended that the fruit should be placed in a piece of net (fishing net) for immersion to reduce loss of solution and expedite return of acid to the vessel used (a cask or drum). After being dipped into clean water the fruit should be transferred to cases in which evaporation of the water will rapidly occur.

Bulk Handling Arrangements for the Coming Harvest.

The Department has given careful consideration to the question of providing trucks for loading wheat in bulk from non-silo stations during the coming season, and, in view of the fact that only one elevator (Quirindi) is likely to be available in the north and north-western districts to enable growers in that part of the State to avail themselves of bulk-handling facilities, it is deemed only equitable that they should be given an opportunity of having a portion of their crop handled in bulk. It has therefore been decided to make available up to five hundred bulk trucks for non-silo stations in the north and north-west only, during the period 21st October to 21st November next, but it is to be distinctly understood that it will be impossible to continue this arrangement beyond the latter date, as the whole of the bulk trucks available will then be required for removing the overflow from existing silo plants.

It must be remembered, said the Minister for Agriculture (the Hon. Hugh Main, M.L.A.) recently, that a factor of prime importance is the space in the terminal elevator available for wheat from non-silo stations, and it is considered that the accommodation provided for under the above arrangement is the maximum that can be spared for the purpose. The Department is under an obligation to take all bulk wheat offering at stations where silo accommodation has been provided, and it is considered that it would be a breach of faith with the growers in those districts were deliveries of bulk wheat refused because storage was not available at the terminal for the overflow.

In view of the above-mentioned arrangement, it will not be possible to provide any bulk trucks for the removal of wheat from non-silo stations in the southern and western districts.

This timely notice will give growers an opportunity of making immediate arrangements for the supply of bags.

Orchard Notes.

SEPTEMBER.

C. G. SAVAGE and R. J. BENTON.

The Citrus Position.

MUCH greater activity than usual in the packing of citrus fruit for export having resulted in a record quantity being despatched, a brief review of conditions affecting the industry may be of value.

The future of citrus production is dependent on our ability to export satisfactorily, and for satisfaction to result there must be a profitable return to the producer, while the consumer must be pleased with his purchase. Standardisation in every detail of marketing is necessary to ensure the confidence of the consumer in the product, and this is not attainable with an unlimited number of packers; it is only possible of achievement when the number of packing houses is restricted.

Much fruit of excellent quality has been despatched in a well-prepared manner, but a small portion of inferior fruit, less carefully prepared, has also been forwarded. With so many—too many—individuals packing, this state of affairs can scarcely be altered, and it is therefore highly desirable that growers should get together and combine their packing efforts. A limited number of varieties, uniformly packed in similar cases under one brand, must be the objective—with distinguishing marks to denote individual grower's fruit if necessary.

Harvesting Considerations.

During recent months citrus growers have been delayed in the marketing of their fruit by weather conditions and by disappointing account sales. There is little indication of improvement in the latter, and growers are advised to spread the sale of their fruit over as long a period as possible—to avoid the speculative tendency so often apparent, and since the practice usually results in better average returns.

The time is overdue for a reconstruction of marketing methods. Many growers will find it impossible to continue to produce unless steps are taken to organise distribution on a much greater scale than has hitherto been possible. Efforts at standardising fruit have at least been partly successful, but little attempt has been made at, and little success has been achieved in, commercialising the product.

The basis of commercialising citrus products must be quality; without that no progress can be made. Quality is dependent on having a good strain (or variety) growing in a suitable soil which is well managed. Fruit produced under conditions where any of these requirements are missing will not be of satisfactory quality. Unfortunately hard and fast rules cannot be laid down as being applicable to the whole State or even for one locality. Each variation in soil and climatic differences must be reckoned with and practices varied accordingly.

As a general rule employ methods which, with a particular soil, will result in fruit being developed as uninterruptedly as possible until maturity is reached. In some soils much more cultivation will be necessary than in others, and the depth of cultivation will vary. Care is necessary to ensure that cultivation does not result in too fine a tilth, particularly in loamy soils and where irrigation may be employed.

Other Timely Citrus Hints.

Pruning.

Very little pruning of deciduous trees should still remain to be done. Citrus, particularly bearing trees, may demand attention, and this month is a very favourable time to shorten back aged lemon trees and to prune up, slightly, orange trees that have limbs near ground level.

Re-working.

Citrus trees of unsuitable strain or variety should be cut back severely this month to force out young growth, on which buds may subsequently be placed. Only trees in at least a fairly thrifty condition are suitable for re-working. The age of the trees is of less importance than a satisfactory soil. For instance, thrifty trees twenty years old growing in a deep soil can be more successfully re-worked than trees eight years old in a less favourable environment.

Orange trees can readily be worked over to any variety of citrus, whilst mandarins may be changed to oranges and probably other citrus varieties.

Planting of Citrus Trees.

Though much planting is not likely to be general, September is a very favourable period for procuring and planting any refills or extensions of area necessary. There is little risk of frost, and the earlier trees are now planted the better is their prospect of becoming established before dry hot windy weather is experienced.

The land having previously been well prepared, holes from 18 to 24 inches square and sufficiently deep should be dug to permit of the trees being planted with the bud unions a few inches above ground level. In heavier than normal soils even higher planting is desirable. On receiving trees from the nursery, wash the puddle from the roots and keep them damp until planted. Cut back the tops and remove the leaves from the stems, protecting the latter with some shelter—paper or hessian—to prevent sunburn. Well-grown one-year-old trees are preferable for planting, though two-year-old trees which have been well grown are usually quite satisfactory. There is greater risk of introducing scale pests on two-year-old trees.

Citrus Diseases.

Last season being so favourable for the development of fungoid diseases, melanose and scab were unusually prevalent. To minimise losses from these diseases, steps should be taken early to have the materials for spray-

ing on hand and the pump in good order, so that the applications of spray may be made at the critical period—about the end of the month or early October.

Bees and Lead Arsenate Spray.

As a result of the campaign inaugurated last year with a view of ensuring that spraying operations with arsenate of lead in connection with the control of codling moth are not commenced too early, considerable benefit has been derived not only by fruitgrowers, but also by beekeepers. It is therefore opportune again to remind apple and pear growers that there is no risk of bees being poisoned, provided the first or calyx spray is applied at the right time.

In accordance with the requirements of the regulations dealing with the control of codling moth, the first spraying of arsenate of lead should be applied when the majority of the petals have fallen. This is the earliest that the spray can be applied to be effective, enabling the arsenate of lead to enter the open calyces after the petals have fallen and before the calyces close.

It is recognised that honey bees, apart from their commercial value as honey producers, have the merit of fertilising the flowers of fruit trees, thus ensuring the set of fruit. Therefore, it is in fruitgrowers' interests to spray at the correct time, both to obtain the best control of codling moth and at the same time to avoid the possible poisoning of bees. The over-zealous grower who sprays his apple and pear trees too early, that is, when the trees are in full bloom, is not only wasting much spray, but may also endanger the lives of bees, which, as already indicated, are valuable aids to fertilisation and the satisfactory setting of the crop.

Later applications of the spray are no menace whatever to bees, as they are made long after blossoming, when the bees are not attracted to the trees. After the first spraying two more applications are to be made at intervals of three weeks, and a fourth is to be carried out four weeks after the third spraying. The spray to use is one and a half pounds of lead arsenate powder (or three pounds of lead arsenate paste) to 50 gallons water.

Overdue Orchard Registrations.

It has come to the notice of the Department that a number of orchardists have failed to register their orchards for the years 1932 and 1933. As these payments are considerably overdue and the orchardists have had ample opportunity to meet their obligations in this respect it has been decided to institute legal proceedings throughout the State with a view of securing payment of the arrears. It is therefore advisable that orchardists who are desirous of avoiding court proceedings and the additional expense which would thus be incurred by them, should remit the outstanding amounts immediately, either direct to the Department of Agriculture, Box 36A, G.P.O., Sydney, or to the nearest Clerk of Petty Sessions.

Butter Quality.

COMMENT ON THE 1932-33 PRODUCTION.

A. M. BROWN, Special Dairy Instructor.*

THE high proportion of choicest quality butter previously attained by New South Wales factories was not generally maintained during the 1932-33 season. This fact presents a more important aspect when the present state of the dairying industry is considered with it. World conditions have combined to cause an unprecedented fall in butter prices—to a very low level. We hear, on every side, theories advanced as to what has caused these conditions, but at the moment, we are not so much concerned with the cause, but rather with the effect of these conditions on the dairying industry, and also with what can be done, if possible, to minimise this effect.

In normal times, good quality has always been regarded as a very material factor in successful dairying. To-day quality assumes even added importance, for on account of money tightness, the exceedingly low price level, and plentiful supplies, the buyer becomes more critical in his purchases and is inclined to pick and choose. He wants the very best for his cash—anything less than this quality he passes over—and the inferior article thus becomes a drug on the market. The greater the percentage of this class of butter offering, the less will be the aggregate ultimate return to the producers, to many of whom at the present time, even the smallest fractional drop in price may mean the difference between just the bread line and possible bankruptcy. When these features are considered, it is not difficult to realise what a serious effect any fall off in quality will have on the dairy industry.

Now as regards some of the principal factors which have been responsible for the deterioration in the quality of New South Wales butter during the 1932-33 season, these may be grouped as follows:—Inferior quality cream, faulty cream grading, competition for cream supplies, and miscellaneous.

A Difficult Season for Cream Quality.

All will agree that the quality of the cream from which butter is made is of fundamental importance in the production of the finished article; if the cream is not of satisfactory quality, then the resultant butter will be likewise unsatisfactory.

During the past season reports from some districts have definitely indicated that this period has been one of the most difficult on record as regards cream quality, the amount of inferior cream supplied to factories having been abnormally large. Naturally the position thus created has caused grave concern to many managers. While in some cases local seasonal con-

*Paper read before the recent conference of the Dairy Factory Managers and Secretaries' Association.

ditions have combined to affect cream quality adversely, the types of off-flavours mostly prevalent in the raw product have been such as to indicate that the faults were within the power of the suppliers themselves to control and rectify, and were not, in the main, due to any particular seasonal condition.

The present low prices received by the supplier for his product increase the necessity for him to obtain the best possible return for the fruits of his labour, and to attain this end it is essential for him to exercise all the knowledge and care possible in order to ensure that the quality of the cream which he delivers to the factory is choicest. He cannot afford to abandon any of the proper methods which previously assisted him to do this—circumstances necessitate his greater concentration on quality.

"Liberal" Cream Grading.

Faulty cream grading has again caused an increased amount of inferior butter. However, in the districts where difficult periods with cream quality have been experienced, the cream grader's job has been an unenviable one. Naturally, when the cream grader has to grade out abnormally large percentages of inferior cream, he becomes concerned. He is likely under these circumstances to take risks by including doubtful lots in the choicest vats. Then again, some cream graders are naturally sympathetic to the present difficult lot of the producer and they have probably allowed their feelings to sway their judgment in some cases, and have passed cream as choicest which under normal circumstances they would have graded out into second grade.

These actions are ill-advised. Firstly, because cream graders who carry out their work in such a faulty manner render themselves liable to have their certificates cancelled for incompetency; secondly, because they are injuring the quality of the butter made at their respective factories and adversely affecting the reputation of the factory's brands; and thirdly, because by too "liberal" grading cream graders are really penalising the suppliers of choicest cream through blending inferior lots with the choicest article and thereby injuring the quality of the resultant butter as a whole.

Cream graders have an important duty to perform to producers, to their factories, to themselves and incidentally to the industry as a whole, and they should realise this fact by grading without fear or favour to the best of their ability, and with the ultimate object always in view of producing the highest class article.

Competition for Cream Supplies.

In some quarters there has been very keen competition for cream supplies. This competition has, in some instances, been the indirect cause of inferior butter, and, therefore, has not eventually been in the best interests of the producer. When such competition has been practised, the incentive has been to adopt a policy of liberal grading until a point has been reached, where, owing to the inclusion of comparatively large amounts of faulty cream in the bulk, it has become impossible to manufacture a

choicest butter, and, on a number of occasions the whole or a considerable part of the output has been graded down, with attendant serious loss to the factories concerned.

There will always be a certain amount of competition for cream supplies while the units of manufacture remain as they are, and as long as some of these units are able, for a time at least, to carry on more successfully than others; but if there has to be competition, let it be such as not to result in any lowering of the standard of quality, accompanied by the consequent eventual loss to the producer.

Boiling Water for Churn Sterilisation.

There are also a number of items actually associated with the work and equipment of factories, which have not been previously referred to in this paper, and which have from time to time caused trouble with quality. The first of these is insufficient cleansing and sterilising of churns.

Chief amongst the factors which have been proved to adversely affect quality is want of cleanliness and the consequent bacterial action brought about thereby. Experience has clearly shown over and over again that churns and workers can easily become insanitary through their being infected with injurious living organisms. The nature of the construction of these items of equipment and the fact of their being made of wood have rendered comparatively difficult the cleansing and sterilising necessary for the removal of this germ life. Such being the case very special care is needed in the direction indicated.

Scientific authorities agree that boiling water is the best sterilising agent, and its use in combination, of course, with a good cleanser, has been freely and decisively advocated amongst those associated with butter factory work for the treatment of churns and other wooden apparatus. Despite this fact, numbers of instances still continue to come under the notice of the field staff of the Dairy Branch where failure to appreciate the necessity for the use of boiling water has indirectly caused trouble with quality. In some of these cases it was stated by the managers that the use of boiling water for churn treatment had been discontinued on account of its having to be boiled in the churns themselves, and that this procedure is injurious to the timber used in their construction. It was found that the temperature of the water being used was far too low to destroy living bacteria, and as a consequence, subsequent observations and bacteriological examinations revealed these same churns to be fat-saturated, evil-smelling and showing high counts of organisms.

Now, if facilities are available for heating the water to a sufficiently high temperature outside the churns and delivering it to them at that temperature, this is considered the best system to follow. If such is not possible, however, and always bearing in mind the extreme importance of temperature for the purpose required, then the water should be heated in the churn as the next best method available towards ensuring an effective temperature.

The matter of keeping the churns and workers in a satisfactory sanitary condition is one of the most outstanding problems in butter factory work to-day, and consequently any expenditure required to instal a system for boiling water away from the churn is warranted, and the installation of such facilities is worthy of favourable consideration generally.

Causes of High Acid Flavour.

In endeavouring to seek the cause of so-called high acid flavour, one is naturally inclined to blame something connected with the neutralising process which has been responsible for too high a percentage of acid remaining in the cream. Without in any way attempting to detract from the necessity for proper neutralising, it is considered that in many instances the amount of acid left in the cream after being neutralised has been of somewhat minor consequence in causing high acid butter, considering that the figures usually aimed at—.05 per cent. to .1 per cent.—are of such a narrow range and comparatively low degree.

On many occasions butter made from cream known to have contained a percentage of acid well within this range immediately before churning, has been commented on by the butter graders as having a pronounced or high acid flavour. This alone would suggest that there are factors other than those connected with neutralising which may be equally responsible for this trouble, such for instance, as insufficient washing of the butter and bacterial action at some period after pasteurisation. Insufficient washing will result in the butter containing an abnormal amount of butter-milk, the presence of which would tend eventually to produce a high acid flavour. Insufficient washing can easily occur, especially during the busier months of the year when the factories are working at high pressure and time is at a premium. It is obviously necessary to take every precaution to remove as much of the butter-milk as possible by the use of sufficient water in washing and by complete draining of the churn.

Insufficient pasteurisation, after-contamination of the cream, or contamination of the butter itself in the churn, may result in numbers of bacteria being present in the finished article, and many types of bacteria besides lactics are capable of producing acid. It is also a fact that the count of organisms present in butter immediately after manufacture will increase very appreciably for some little time at least, although the types may alter and the numbers decrease.

It will be easily understood how, under the circumstances outlined, additional acid can be produced in butter after it is manufactured, and result in the possibility of so-called high acid flavour being noted by the graders on the Sydney selling and grading floors.

Re-inoculation of Pasteurised Cream.

There have been, during the year, a number of additional instances of unpasteurised cream escaping into the tray at the bottom of the regenerative pasteuriser through the two-way cock which serves to allow the raw

cream to enter the dome of the machine. In this way the pasteurised cream becomes re-inoculated with bacteria, and could cause inferior butter. By giving this tap regular attention and seeing that it has not become worn and ill-fitting, such an occurrence would be prevented.

In conclusion I would like to say that there is no need for pessimism concerning the future quality of our butter. Faults have occurred before and have been remedied. It is perhaps too much to hope that they will not occur again in some form or another on account of the numerous factors associated with butter factory work which can cause butter to deteriorate, but constant care and attention to detail can reduce the causes of these faults to at least a minimum. Let the present setback in quality serve as an added incentive to those concerned to accomplish this aim.

New South Wales Farmers to Tour New Zealand in 1934.

Under the auspices of the New South Wales Council of Agricultural Associations, the New Zealand Government Tourist Department is arranging a tour of the fat lamb raising, dairying and agricultural districts of New Zealand. The tourists will leave Sydney by the "Monowai" on 2nd February, 1934, and will arrive back in Sydney on 23rd idem. The itinerary embraces both islands of the Dominion and will touch most of the important agricultural and pastoral areas and scenic wonders.

This tour should present an excellent opportunity for farmers of this State to study the methods of the New Zealand farmers, particularly in the matter of grassland farming.

Application forms and a booklet describing the tour are obtainable from the New Zealand Government Tourist Bureau, corner Pitt-street and Martin-place, Sydney.

Treating Horses for Bots in the Stomach.

The manner in which the bots bury their heads and the toughness of their skins, make treatment very difficult, but the most common and safe remedy is from 1 to 2 oz. of turpentine mixed with the white of an egg and given in 1 to 2 pints of raw linseed oil on an empty stomach. Though not wholly efficacious, its administration is often followed by the expulsion of a number of bots.

The most reliable treatment for bots in the stomach is the internal administration of carbon bisulphide. As this drug may cause severe injury if not given skilfully, the stockowner is advised to consult a veterinary surgeon if he desires to make use of this treatment.

The following treatment has also given good results: After starving the animal for at least twenty-four hours, give 1 quart of molasses or dissolved sugar in 1 quart of milk, and thirty minutes later 2 oz. of alum dissolved in 1 quart of water, followed in about an hour by a quick-acting laxative, such as ½ lb. of Epsom salts, or 2 pints of raw linseed oil.

Scours in Calves.

CALF DIARRHŒA AND CALF DYSENTERY.

[Concluded from page 548.]

W. L. HINDMARSH, B.V.Sc., M.R.C.V.S., D.V.H., Senior Veterinary Research Officer, Glenfield.

Scours Due to Parasitic Worms ("Black Scours" and "Green Scours").

UNDER this heading are included most of those cases which are known to farmers as "black scours" and "green scours." The condition usually affects calves from two to three months onward and is due to infestation of the stomach and bowels with various parasitic worms. Although worm parasites produce their most marked effect in calves under nine months of age, it must be remembered that they may produce symptoms of ill-health in cattle of greater age.

A number of worms are capable of infesting cattle and causing sickness and death. That most commonly known is the stomach worm or wire-worm of cattle. This is recognised because it can readily be seen in the fourth stomach, but a fact not grasped by stock owners is that many tiny worms, about a quarter of an inch to half an inch in length, and incredibly fine, may infest the stomach and bowel in great numbers and be responsible for considerable loss. These tiny worms cannot be detected in the ordinary post-mortem examination carried out in the field, although by careful examination their presence can be demonstrated. The female worms each lay large numbers of eggs which pass out in the dung. After hatching, and undergoing certain development on the pastures, the hatched embryos may be taken up with the grass and herbage eaten by the cattle. On reaching the stomach and bowels they grow to full size, become sexually mature, and lay eggs which are carried out in the dung, and so the process of continual reinfestation may go on.

Symptoms.

The "stomach worm" or "wire worm" of cattle and sheep is a blood sucker, and infestation with this parasite therefore causes anaemia (poorness of blood) and sometimes scouring. The excreta is greenish in colour, but sometimes the colour is so dark as to be almost black. In dealing with worm infestation it is well to bear in mind that all infested animals do not scour, some may even appear to be constipated, but the majority will show some softening of the excreta and many will scour profusely. Other symptoms that will be noted are—

(1) *Excessive pallor of the skin,* membranes of the eye, and membranes lining the mouth. Instead of a healthy pink colour these membranes have a very pale pink or even greyish-white colour.

(2) *Development of "bottling" under the jaw.*—This bottling is due to collection of dropsical fluid under the angle of the jaw and is characteristic of most infestations with internal parasites.

(3) *Loss of condition.*—Rapid loss of condition and emaciation always accompany severe infestation with worm parasites attacking the stomach and bowels.

With the tiny parasites which attack the bowels and stomach of cattle the symptoms are similar to those caused by the stomach worm except that the bottling and pallor of the skin and visible membranes is not as intense as that seen in infestation by the latter worm. Rapid loss of condition and scouring are most marked.

Diagnosis.

The occurrence of sickness and death, accompanied by loss of condition, scouring and bottling should lead to the suspicion that the stock are infested with parasitic worms, and a post-mortem examination of a very sick calf should be made to confirm the diagnosis. Some of the larger worms, such as the wire worm of the stomach, are readily seen, but the smaller parasites are difficult to demonstrate in an examination made in the field. Sometimes, by smearing a little of the stomach content, or the content of the first few feet of the small bowel, on a piece of clean glass or on the hand, the tiny worms will be discovered, but even when the worms are present the owner may not recognise them as parasites. In the case of doubt, skilled assistance should be sought.

Treatment and Prevention.

All the animals in the infested herd should be treated with a reliable remedy, after starving for twenty-four hours. A number of preparations will give good results, but the bluestone and mustard drench is cheap and very satisfactory. This is made up as follows:—

Bluestone crystals (copper sulphate)—8 oz.
Mustard—8 oz.
Water—3 gallons.

The bluestone should be dissolved in the water in an enamel or wooden receptacle. (Do not use iron buckets or kerosene tins.) The mustard is mixed to a smooth paste and then stirred into the bluestone solution. The mixture must be kept stirred, since the mustard will tend to sink to the bottom. The doses are as follows:—

Calf aged 4 months—3 oz.
Calf aged 6 months—4 oz.
Calf aged 9 months—6 oz.
Calf aged 12 months—8 oz.

Necessity for Repeated Treatment.

One treatment will produce some good effect, but it will be necessary to repeat the dosing in a fortnight, and again in a month, to obtain the best

results. Where the infestation is heavy, and the stock are constantly re-infesting themselves from the eggs scattered over the pastures, drenching at regular intervals right through the year may be necessary.

If stock have become very low in condition, many may eventually die in spite of the treatment. This is because, although most of the worms have been killed by the medicament, the animals have lost so much vitality that their bodies are unable to build up and restore the tissues damaged as a result of the invasion by the worms. Hence when a diagnosis of worm infestation has been made, it is essential that treatment should be carried out as early as possible.

General Management.

A week after the cattle have been drenched they should, if possible, be removed to other paddocks, so that they will not be as likely to re-infest themselves. The infested paddocks used by the calves might be grazed by adult cattle, these not being so susceptible to the attack of worms. Most of the parasites which infest stock require moisture for their development on the pastures. Hence, low-lying areas which are constantly damp, swampy patches and soakages, are dangerous in that they provide conditions suitable to the hatching of the eggs and the later development of the embryo worms. In districts where worm infestation occurs the young stock should be grazed as far as possible on well-drained paddocks. Frequently, the ill effects of worm infestation is most marked in the winter months, when the pasturage is known to be innutritious, and the calves should then be given a daily ration to make up for this lack of nutriment.

Scouring in Calves Due to Coccidia.

Coccidia are minute egg-shaped parasites not visible to the naked eye. Taken in with the food they multiply within the bowels of animals with extraordinary rapidity, becoming buried in the lining membrane. In some countries of the world they are regarded as an important cause of blood scours or red scours in calves, but in New South Wales, although coccidia are known to infect some of our stock, they are not known to have been the cause of extensive mortality.

The most noticeable symptom is severe diarrhœa, the droppings usually containing blood. Affected animals soon lose condition and become anaemic. Definite diagnosis of the complaint can be made only by microscopical examination.

Treatment is frequently not satisfactory. Cresol, naphthaline, and similar disinfectants have been used, in some cases with success and in others with no good results. Calves should be taken off other feed and given whole milk until symptoms abate.

Scours Due to Other Causes.

Any irritant material eaten by calves is likely to set up inflammatory changes in the stomach and bowels, and thus, where the animals have had

access to poisonous substances, or poisonous plants are growing in the paddocks, consideration should be given to these conditions when endeavouring to ascertain the cause of the illness.

Poisons containing arsenic are employed for so many purposes, such as sheep and cattle dipping, weed destruction, etc., that there is a tendency to overlook the poisonous and dangerous nature of the material used, and there is frequently a lack of care in its handling. Arsenical preparations often have a salty flavour and are readily licked by stock.

Certain plants, too, are capable of causing gastritis and enteritis, and when seasons are dry cattle will often eat herbage and shrubs which they would leave untouched at normal times. For instance, bracken fern is commonly eaten in such circumstances and may be responsible for considerable loss. There is, therefore, necessity for a careful survey of the paddocks where the sickness and mortality are occurring, so that any evidence that plants, usually not eaten, have been taken by cattle, can be observed.

(*Concluded.*)

A Mustard Poultice will Relieve the Animal of Pain.

The circumstances under which mustard can be used in veterinary practice are essentially similar to those arising with human beings.

In the relief of local pain the mustard poultice or plaster is invaluable. The size of the poultice naturally depends on the size of the animal for which it is intended and also the area of the body affected. The poultice is prepared by making the mustard into a thin paste with lukewarm water. It is applied to the affected area and it should be left for a period of time depending on the intensity of the pain. No poultice, however, should be left on for more than twenty minutes. In addition to the pains caused by muscular stiffness, etc., such pains as flatulent colic can be relieved by the application of a mustard poultice at the site of the pain.

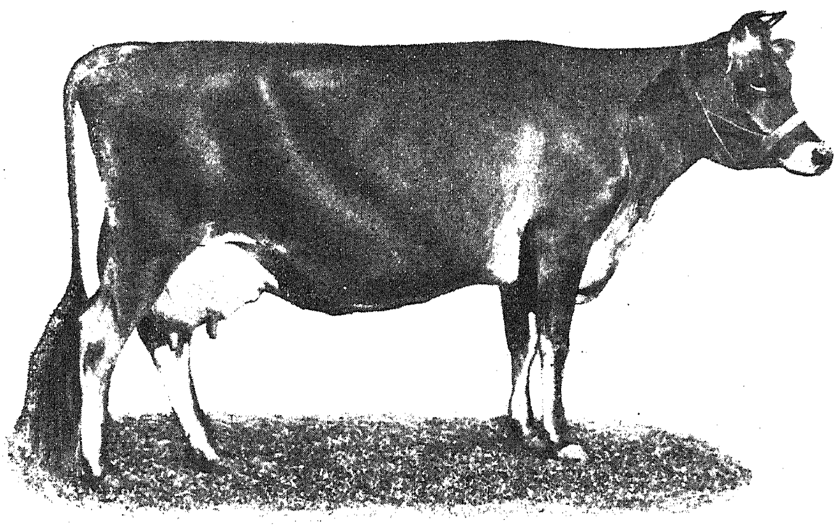
In preparing a mustard poultice or bath, boiling water or water above 140 deg. Fahr. should not be added directly to the mustard owing to the fact that the enzyme myrosin would be inactivated. Where a really hot poultice is required it is best to mix the mustard with a little cold or luke-warm water and allow to stand for a few minutes to enable the volatile oil to be liberated. Boiling water can then be added if desired. It is not desirable to apply a mustard poultice to broken skin. If a poultice made from mustard alone it too strong, it can be made less potent by mixing it with linseed meal or with flour.

Dairying Notes.

SEPTEMBER.

"Richmond Aurora"—Another Notable College Jersey.

The latest cow to bring the merit of the Hawkesbury Agricultural College Jersey herd again into the limelight is "Richmond Aurora," which for its twelve months' test just ended produced 15,060 lb. milk of 6.0 per cent. average test, equal to 899.08 lb. butter-fat or 1,083 lb. commercial butter. This Jersey was four years and three months old at the commencement of the test in August, 1932.



Richmond Aurora.

The milk and butter-fat yields for each of the twelve periods of the test were calculated on a test made every thirty days, the last being on a thirty-five days' basis.

	Milk, lb.	Butter fat, lb.		Milk, lb.	Butter fat, lb.
August	1,185	68·64	March	1,200	73·77
September	1,440	84·24	April	1,125	68·07
October	1,335	72·96	May...	1,215	78·30
November	1,320	76·41	June	1,215	83·40
December	1,170	63·42	July	1,260	80·50
January	1,305	72·57			
February	1,290	76·80	Total for 365 days...	15,060	899·08

During the greater part of the test "Richmond Aurora's" ration consisted of 20 lb. silage and 10 lb. wheaten or lucerne chaff, the concentrate portion of the ration containing bran, linseed meal, bone meal, maize meal, and at times crushed oats. Owing to the poor quality of the natural pastures at the College farm, the cow was given for a short period each day, when possible, a picking of green wheat, barley or lucerne.

Treatment for Hoven or "Bloat."

SPRING, with its abundance of succulent and dew-laden green feeds, ca depended upon to produce its full share of cases of hoven or bloat in co The condition is caused by the formation of large quantities of gas in t rumen or paunch, and in consequence a swelling of the left flank. T trouble is most often caused by turning hungry cattle on to succulent gre feed, such as lucerne, clover, etc., or by changing cattle over suddenly fr dry feed to succulent green feed, particularly if wet or moisture laden.

Keeping the mouth open with a gag, or a piece of wood, until the b has belched most of the gas by mouth will be useful in mild cases. T internal administration of 1 oz. of bicarbonate of soda, and 1 oz. of ginge is sometimes useful, and it may be repeated in a few hours—if necessary. In a bad case the most effective treatment is the puncture of the paunch. This is done on the left side in the flank—at a point equidistant from the last rib, the edge of the loin bones, and the angle of the haunch. The correct instrument for this purpose is the trocar and cannula. The cannula is a tube through which passes a sharp-pointed instrument—the trocar. This instrument is thrust into the rumen, and the trocar is withdrawn, leaving the cannula in place, and through this the gas escapes. In case of emergency a knife may be used in the same way, the gas escaping through the cut, but complications may set in and cause death if this is not done expertly. After the gas has escaped the animal might be given a dose of linseed oil ($1\frac{1}{2}$ pints) and turpentine (1 tablesponful). This mixture should be well shaken up while being given.

Purchase a Pure-bred Bull on Terms.

THE Government has decided to set aside a sum of £20,000 for the purpose of making advances to dairy farmers and beef cattle breeders to enable them to secure pure-bred bulls with a view of improving the quality and productive capacity of their herds.

It is proposed that the amount of advance to any one settler shall not exceed £50, exclusive of freight, and that the advance in respect of any one bull shall not exceed £25, exclusive of freight. If desired by the applicant, the advance can be applied towards the purchase of a higher-priced bull, provided the applicant pays the balance of the purchase money to the Department prior to the completion of the purchase.

Repayment of advances will be extended over a period of five years, carrying interest at the rate of 4 per cent.

The selection and purchase of all bulls will be under the supervision of the Herdmaster of the Department, in order to ensure that only suitable bulls will be purchased, and, in addition, no bull will be accepted until it has passed the tuberculin test and the agglutination test for contagious abortion.

Forms of application and any further details will be made available on application to the Officer-in-charge of the Rural Industries Branch, Department of Agriculture, Box 36A., G.P.O., Sydney.

Interesting Figures Regarding Inland Dairying.

DISCUSSING recently the trend of dairy production in the State, Mr. L. T. MacInnes, Director of Dairying, pointed out that though the natural productivity of the coastal districts had fallen, it was being compensated for by pasture improvement and fodder conservation. For example, production in the Richmond River district had increased 25 per cent. in the last ten years. In inland districts the increase in dairy production had been phenomenal owing to the change-over of many producers of wheat and wool to dairying. Four or five years ago the production in those districts was 3,000 tons of butter, whereas last year it was 15,000 tons, and the prospects, owing to good feed and increased numbers, were that there would be a further increase this year. An interesting fact was that cattle transferred from the coast increased their yields by 30 to 50 per cent. under inland conditions.

Dairying was showing better returns than wheat and wool production, and since factories of the same high standard and efficiency as on the coast had been erected, there was little likelihood of the industry being relinquished. Herd-recording, too, had shown that cattle in inland districts were far ahead of animals on the coast. The following figures showed the yield of butter-fat per cow last year for the various districts:—

	lb.		lb.
Byron Bay	157	Illawarra	230
Richmond	145	Far South Coast	180
Clarence	140	Western Riverina	205
Macleay-Manning	155	Western District (Orange) ...	198
Hunter River	165	North-western (Tamworth) ...	190

The average for the whole State was 165 lb. butter-fat per cow, an increase of 35 lb. in the last five years and of 5 lb. in the last season. This latter, applied to the herds used for butter production represented £300,000, which was some offset to the drop of £18 per ton in the price of butter, which amounted to £690,000 for the State.

Dairy Farm Grassland Management.

THERE is no gainsaying the importance of proper grassland management to the dairy-farmer, and it is the intention of the Department of Agriculture, acting in conjunction with the Royal Agricultural Society, to demonstrate the profitableness of this practice by encouraging the holding of dairy farm grassland management competitions.

To the Pambula district belongs the distinction of being the first to conduct a competition along these lines, and to Mr. J. E. Cole, of South Pambula, belongs the honour of winning the first competition of this nature carried out in New South Wales. That all practical aspects of pasture management are taken into account can be seen from the table of results, wherein is shown the scale of points for judging.

PAMBULA Dairy Farm Grassland Management Competition.

Scale of Points.		J. E. Cole.	H. & C. Cole.	J. A. Martin.	L. S. Perry.	Hart Bros.
1. Layout of Farm—	Points	Points	Points	Points	Points	Points
(a) Number and size of paddocks in relation to :—						
(1) Ease of working	15	14	13	13	12	11
(2) Type of pasture sward	20	17	17	19	16	17
(3) Number of cattle kept	15	14	13	13	13	13
(b) Watering facilities	25	16	20	17	22	17
(c) Suitability and general condition of fencing, gates, etc.	10	8	8	8	8	8
(d) Provision of shade and shelter trees	10	6	8	6	9	7
(e) Rough sketch plan of layout of farm	5	0	0	0	0	0
Total for layout of farm	100	75	79	76	80	73
2. Pastures—						
(a) Grazing methods adopted	60	50	48	48	40	45
(b) Variety of grasses and balance of winter and summer growing pasture plants	60	55	45	55	40	50
(c) Presence of clovers and other legumes	30	25	23	27	20	24
(d) Density, leafiness and palatability of pasturage	30	26	22	25	21	22
(e) Freedom from weeds, other useless plants and diseases	20	17	16	17	16	16
Total for Pastures	200	173	154	172	137	157
3. Mechanical Treatment of Pastures—						
(a) Effective use of grass harrows, renovators, mowers, etc.	30	26	23	22	5	10
(b) Effective clearing, improvement and utilisation of swampy, and other relatively unproductive areas ...	20	16	15	18	16	12
(c) Improvement in carrying capacity of the farm	70	29	43	21	38	35
(d) Effective use and application of fertilisers	30	14	20	18	0	10
Total for Mechanical Treatment of Pastures	150	85	101	79	59	67
4. Utilisation of Surplus Pasturage—						
(a) Amount of grass hay or grass silage stored	30	18	0	14	2	2
(b) Location and protection of stacks, pits, etc.	10	9	0	8	8	8
(c) Suitability and quality of feed ...	10	8	0	9	8	8
Total for Utilisation of Surplus Pasturage	50	35	0	31	18	18
5. Net Return per £100 Capital Value ...	200	53	80	40	73	43
Total Points scored	700	421	414	398	367	358

Mr. Cole's home farm, "The Laurels," is 70 acres in area, comprising 30 acres of flat country subdivided into ten small paddocks, and 40 acres of hill land subdivided into four paddocks. A further 122 acres of land higher

up the Pambula River, consisting of 72 acres of medium quality to sandy flat subdivided into eight paddocks, and 50 acres of scrub that is of little value for grazing. Mr. Cole's milking herd averages twenty-eight cows, the total stock carried being thirty-four cows, eleven heifers and two bulls.

The subdivision into small paddocks makes it possible to control the grazing and treat the pastures on this property efficiently, with the result that there is a good variety of grasses present, and, even in paddocks that carry mostly paspalum during the summer months, are to be found, during the winter months, a good mixture of winter grasses and a large amount of clover, the results of close grazing and mowing where necessary. An area of 8 acres of paspalum was mown last January, the cut grass being ensiled in a pit. This 35 tons of pit silage turned out very successful.

Two small paddocks that had been laid down to subterranean clover provided extensive grazing for the herd last season and increased the milk yield appreciably. These areas looked very well when inspected by the judge, Mr. John L. Green, local Agricultural Instructor, in July last. All the flats and most of the hill country on Mr. Cole's farm are harrowed regularly, this being recognised as a very easy method of effecting pasture improvement in the Pambula district, particularly on the flats. Excellent results from top-dressing the pastures on the Pambula flats with 1 cwt. superphosphate per acre were obtained by Mr. Cole and other farmers. The superphosphate greatly benefited the subterranean clover.

New Dairy Premises Must Comply with the Regulations.

DAIRY farmers contemplating the erection of new dairy buildings or the renovation of old structures are reminded that these must comply with the Dairies Supervision Act, the requirements of which are readably set out in the *Dairy Manual,* which can be obtained from the Department for the small sum of one shilling, plus 1d. for postage.

Besides setting out the principles of construction and location to be adhered to, the *Dairy Manual* includes numerous plans of cow bails, combined feeding stalls and milking bails, separate feeding stalls, separator room, milk and cream store room, bull shed and calf pens. These will prove of great assistance to the dairy farmer who undertakes the erection of these buildings himself. As for those who are having dairy buildings erected under contract, it is a wise plan always to insert a clause in the contract to the effect that the buildings must comply with the provisions of the Dairies Supervision Act, as set out in the *Manual.* There are excellent reasons why the Act specifies certain methods of construction, materials, location, etc., and it must be very annoying to the dairy farmer to find out, after having paid to have the job done, that further money has to be expended on alterations to meet the requirements of the Act. The farmer can safeguard against this contingency by inserting the clause suggested above in the building contract.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
Lunacy Department, Parramatta Mental Hospital	12	1 Sept., 1933
Department of Education, Gosford Farm Homes	38	2 ,, 1933
James McCormack, Tumut	98	9 ,, 1933
P. Ubrihien, Corridgeree, Bega	123	15 ,, 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1933
E. W. Flower, Binna Burra	56	18 ,, 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns)	100	20 ,, 1933
G. V. Ralston, "Porphyry," Seaham	98	21 ,, 1933
E. C. Nicholson, Jillamatong, Cerowa	180	23 ,, 1933
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	43	25 ,, 1933
G. Powell and Sons, "Loch Lomond," Armidale	22	26 ,, 1933
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1933
E. E. McMullen, Springnook, Holbrook	31	3 Nov., 1933
W. R. Boughton, Holbrook	33	3 ,, 1933
C. Maynard, Holbrook	12	3 ,, 1933
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1933
Stace Bros., Taylor-street, Armidale	26	1 Dec., 1933
Department of Education, Brush Farm, Eastwood	8	3 ,, 1933
Lunacy Department, Morisset Mental Hospital	29	7 ,, 1933
W. W. Martin, "Narooma," Urana Road, Wagga	150	14 ,, 1933
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1933
E. E. Winder, Wybong Road, Muswellbrook	40	22 ,, 1933
C. J. Parbery, Allawah, Bega	122	8 Jan., 1934
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay	8	9 ,, 1934
G. H. Hooper, Oak Hill, Bethungra	10	19 ,, 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys)	81	22 ,, 1934
A. L. Logue, Thornboro, Muswellbrook	45	25 ,, 1934
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	13	27 ,, 1934
J. B. Burtenshaw, "Sunnyside," Inverell	42	27 ,, 1934
Parker Bros., Hampton Court Dairy, Inverell	82	27 ,, 1934
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1934
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1934
W. K. Frizell, Rosenstein Dairy, Inverell	37	2 ,, 1934
W. Pigg, Redlands Dairy, Inverell	27	2 ,, 1934
A. N. de Fraine, Happy Valley Dairy, Inverell	28	3 ,, 1934
G. L. Genge, "Easton," Armidale	39	7 ,, 1934
J. Davies, Puen Buen, Scone (Jerseys)	191	9 ,, 1934
Forster & Sons, Abington, Armidale	189	12 ,, 1934
Newington State Hospital and Home	91	16 ,, 1934
A. B. Finney, Fox Ground, Gerringong	33	17 ,, 1934
Lidcombe State Hospital and Home	153	20 ,, 1934
Lunacy Dept., Gladesville Mental Hospital	34	22 ,, 1934
Riverina Welfare Farm, Yanco	89	24 ,, 1934
Department of Education, Yanco Agricultural High School	39	24 ,, 1934
W. J. Miller, 199 Mann Street, Armidale	7	6 Mar., 1934
New England Girls' Grammar School, Armidale	41	8 ,, 1934
F. C. Butler, Yarranung, Bega	122	24 ,, 1934
G. W. Young, "Boorganna," via Wingham	39	30 ,, 1934
Hawkesbury Agricultural College (Jerseys)	118	3 April, 1934
A. D. Frater, "Fairview Dairy," Inverell	61	5 ,, 1934
Cowra Experiment Farm	26	27 ,, 1934
St. Joseph's Girls Orphanage, Kenmore	10	4 May, 1934
G. A. Parish, Jerseyland, Berry	93	5 ,, 1934
Marion Hill Convent of Mercy, Goulburn	27	5 ,, 1934
St. Joseph's Convent, Reynold-street, Goulburn	4	5 ,, 1934
St. John's Boys' Orphanage, Goulburn	18	5 ,, 1934
W. M. McLean, Five Islands Road, Unanderra	76	6 ,, 1934
Koyong School, Moss Vale	3	8 ,, 1934
Miss N. C. Brenan, Arankamp, Bowral	15	10 ,, 1934
Tudor House School, Moss Vale	21	13 ,, 1934
Limond Bros., Morisset	38	1 June, 1934
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 ,, 1934
Hurlstone Agricultural High School, Glenfield	44	22 ,, 1934
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	261	28 ,, 1934
St. John's College, Woodlawn, Lismore	34	29 ,, 1934
Grafton Experiment Farm	271	14 July 1934
Australian Missionary College, Cooranbong	62	19 ,, 1934
William Thompson Masonic School, Baulkham Hills	37	20 ,, 1934

TUBERCLE-FREE HERDS—*continued*.

Owner and Address.	Number tested.	Expiry date.
St. Patrick's College, Goulburn	8	21 Sept., 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 " 1934
Wagga Experiment Farm (Jerseys)	60	25 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone	92	9 Nov., 1934
Wolaroi College, Orange	11	10 " 1934
J. L. W. Barton, Wallerawang	16	17 " 1934
Wollongbar Experiment Farm, Lismore (Guernseys)	123	11 Jan., 1935
George Rose, Aylmerton	2	21 Feb., 1935
Mittagong Farm Homes	36	22 " 1935
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	19	23 " 1935
T. H. Maples, Racecourse Farm, Bega	48	2 Mar., 1935
P. M. Burtenshaw, Killean, Inverell	63	28 " 1935
J. P. McQuillan, Bethungra Hotel, Bethungra	25	4 April, 1935
W. Newcomb, "Minnamurra," Inverell	85	6 " 1935
Lunacy Department, Kenmore Mental Hospital	84	4 May, 1935
St. Michael's Novitiate, Goulburn	4	4 " 1935
Rydalmere Mental Hospital	65	11 " 1935
W. S. Turnbull, Flanders Avenue, Muswellbrook	37	28 July, 1935
Sacred Heart Convent, Bowral	10	3 Aug., 1935

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis :—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—MAX HENRY, Chief Veterinary Surgeon.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free.

Owner and Address.	Number in herd.
Martin Bros., "Narooma," Urana Road, Wagga Wagga	86
Cann, H. J., The Gap, Alstonville	...
White, F. J. and Sons, Bald Blair, Guyra	238
Mott, T., Main Arm, Mullumbimby	25
Henderson & Son, Upper Wantagong, Holbrook	95
Hawk, J. T., Ben Lomond	42
Sams, C. R., Wilson's Creek, Mullumbimby	34
Walker, Jas. R., "Strathdoon," Wolesley Park	32

—MAX HENRY, Chief Veterinary Surgeon.

INFECTIOUS DISEASES REPORTED IN JULY.

The following outbreaks of the more important infectious diseases were reported during the month of July, 1933 :—

Anthrax	Nil.
Blackleg	11
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	1
Swine fever	Nil.
Contagious pneumonia	Nil.
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

Strangles.

C. J. KING, B.V.Sc., Veterinary Officer, Stock Branch.

STRANGLES is an acute infectious fever of horses, asses and mules. It is associated usually with inflammation of the nasal passages and throat, accompanied in most cases by abscess formation in the lymph glands of the head and occasionally elsewhere in the body.

The Cause.

The cause of the disease is a minute, bacterial micro-organism, known scientifically as *Streptococcus equi*. To the practical stockowner the well-established predisposing causes are of great importance. Over-crowding plays an important part in the occurrence of this disease, since outbreaks of strangles are common in dealers' stables and remount depots. Over-working young horses, also, lowers their resistance and renders them more susceptible to the disease, particularly if they are poorly fed and housed. The season of the year and the climatic and weather conditions all play an important part in both the occurrence and the severity of the infection. Leaving young horses exposed to draughts and rain for long periods, tiring railway journeys without adequate feeding and attended by harsh treatment can all favour infection by lowering the resistance of the animals. Thus a predisposition to contract strangles may be caused by a common cold infection, which prepares the tissues for the reception of the micro-organisms by reducing the vital protective powers of the body.

Most outbreaks occur in the spring, autumn and winter, when the weather conditions are changeable and at times severe. Outbreaks of the disease are rare in the summer.

How Infection Occurs.

Natural infection in most cases appears to result from horses taking feed or drinking water contaminated with nasal discharge. Infection by inhalation is common only in stables, where horses affected with strangles and healthy animals are associated together in a confined space. Through contamination with pus and nasal discharges the most varied objects may become carriers of the infection, such as feeding utensils, bedding, straw, the walls and floor of the stable, and even the hands and clothes of the farmer or attendant. Thus it can be seen how the greatest care must be taken to prevent spread of the infection from diseased to healthy animals.

Symptoms.

Strangles is commonest and most serious in horses under five years of age. Mature horses living in a stable where an outbreak has occurred are frequently unaffected, even though every opportunity for infection occurs. There are two forms of strangles, the ordinary (or typical) form and the irregular (atypical or "bastard") form.

Typical attacks commence with dullness, lack of appetite and rise in temperature. Very often the first symptoms noticed are a swelling between the branches of the lower jaw and stiffness of the neck, but as a rule the animal is noticed to be dull and "off feed" for a day or two before active symptoms develop. A profuse nasal discharge commences when the disease is progressing, at first thin and watery, but soon becoming thicker and eventually of a creamy-yellow appearance, issuing from both nostrils. The breathing becomes impeded and accelerated due to the mucus and pus clogging the respiratory passages. Coughing is often a prominent symptom, due to pain and inflammation of the throat, and this condition sometimes prevents swallowing and leads to marked distress.

Two or three days after the first symptoms make their appearance, a swelling develops below the jaw, which enlarges and becomes hot, tense and painful to the touch. This is due to inflammation of the lymph glands of the vicinity. For two or three days more the affected parts increase in size, tensity and painfulness, until a soft spot, usually over the most pronounced part of the swelling can be detected. This hot, painful swelling is usually considered the most characteristic symptom of strangles. The abscess bursts and discharges a considerable quantity of thick, creamy, yellowish-white pus, usually containing streaks of blood. After the abscesses break or are lanced, and the nasal discharges become well established the fever abates and the appetite returns. This is followed by a gradual improvement in the health of the animal, a progressive decrease in the discharge from the nose, and at the end of ten days or a fortnight the animal has fully recovered.

The foregoing is the usual course of events in strangles, but the disease may assume a malignant form, or complications may arise which may prove fatal. The symptoms in this form of the disease are generally vague, consisting of colic, abdominal pain, depression, constipation, capricious appetite and a temperature which does not remain constant. The animals rapidly fall away in condition, and death from the internal rupture of an abscess with ensuing complications may occur in from one to three weeks, although a chronic form lasting for from two to three months may develop.

Treatment.

If a small paddock is available, it is a good plan to use it for the sick horse, where the animal can have freedom and ease of movement with a small picking of grass if it so desires. With regard to food it is advisable to feed on warm mashes, and to tempt the appetite of the sick horse with feeds for which it shows a predilection. Green feed when available is recommended. A first principle which should on no account be overlooked in the treatment of this disease is that drenching with fluid food or stimulants is to be rigidly avoided. Owing to partial paralysis of the muscles of swallowing the drench is liable to be drawn into the lungs. In the case of a sick and debilitated horse this usually results in a septic pneumonia and gangrene of the lungs with a fatal termination. Treatment of the swelling

between the jaws should receive attention, and as soon as the abscess softens it should be opened cleanly at its lowest point. If the abscess does not come to a head a little full-strength blister should be lightly rubbed over the site of each developing head. A suitable blister is:—

Red oxide of mercury	1 part.
Liquid paraffin	2 parts.
Vaseline	6 parts.

When an animal is obviously suffering from a painful and inflamed condition of the lining membrane of the throat, shown by marked difficulty in swallowing, and food and water being returned through the nostrils, a mustard plaster should be applied to the skin surface of the throat.

After the abscesses have burst or been opened the treatment to be followed consists in dilating the opening to give free discharge to the pus and in washing out the abscess cavity with warm water, to which has been added a little Condy's crystals. Two ounces of epsom salts in the drinking water, three times a day, acts as a mild laxative and assists in reducing a high temperature in fevered cases.

Owing to the great diversity of symptoms in complicated and atypical cases, the owner should call in assistance and be guided by the veterinary surgeon, for each case must be treated on its merits.

Prevention.

This consists in keeping healthy horses, and especially young animals, away from horses affected with the disease. It is necessary, in order to prevent future cases, to disinfect thoroughly the stables used by animals suffering from the disease.

In the care of valuable horses it might be found advisable to use a vaccine as a preventive, all young horses being inoculated.

Scheme to Supply Flock Rams on Terms is to be Continued.

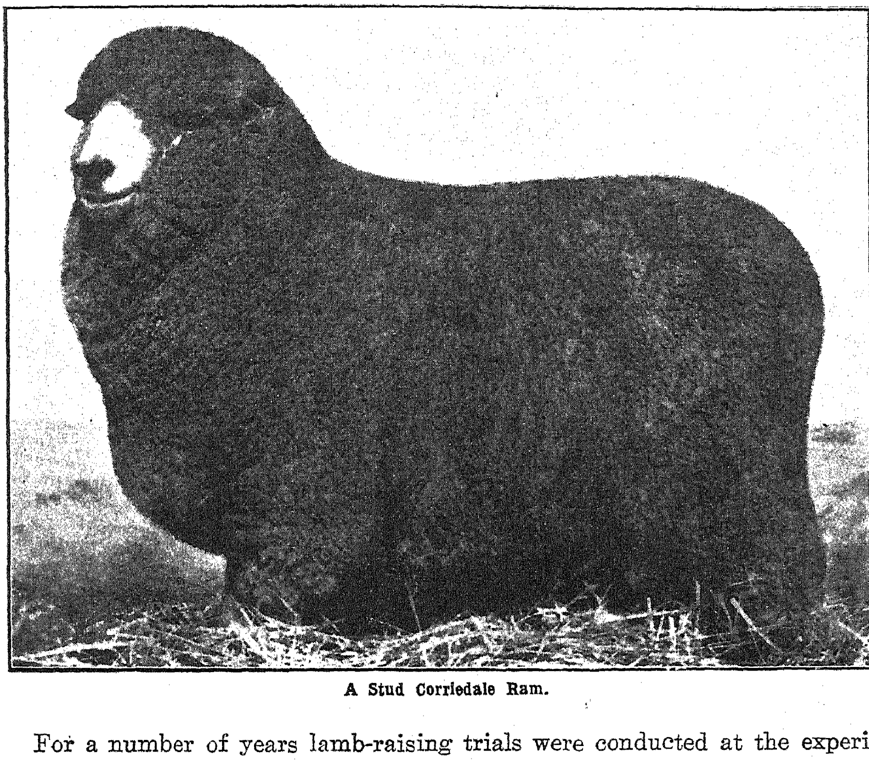
The arrangements by which owners of small flocks may obtain rams on easy terms are to be continued. As in the previous season, assistance will be restricted to owners of not more than 2,000 ewes who would otherwise be unable to obtain suitable rams, and the advance to any one applicant will be limited to £40, plus freight, if any. The rams must be purchased from registered stud breeders and the maximum advance per ram will be £3 3s., but under certain conditions the advance may be applied towards the purchase of higher priced rams. Repayment of the advance with interest at 4 per cent. per annum will be required in two equal instalments from the second and third years' proceeds. It will be necessary for applicants to execute a mortgage over the rams supplied and for existing mortgagees, if any, to consent to the orders against 1935 and 1936 seasons' wool proceeds, which will be required from the settler. The selection of all rams will be under the supervision of the Sheep and Wool Branch of the Department.

Sheep for the New England Mixed Farmer.

Trials to Determine Suitable Types.

E. A. ELLIOTT, Sheep and Wool Expert.

THE small-framed Merino sheep typical of New England has not proved to be a profitable type for the men with smaller areas, principally mixed farmers, in that district, and for some years the Department has been conducting trials in an endeavour to decide on a satisfactory type for these conditions.



A Stud Corriedale Ram.

For a number of years lamb-raising trials were conducted at the experiment farm at Glen Innes, but the results showed that under the conditions which exist on that farm the season is too slow—by weaning time the lambs have not attained sufficient development or weight to make them desirable fat lambs.

A trial was therefore commenced in 1929 to investigate the value of the Corriedale and Polwarth breeds, when mated to the Merino (which, because of its numbers, had to be taken as the basis), for the production of a dual-purpose sheep—one growing a desirable fleece and with a larger frame than

the Merino, making it a more suitable sheep to market. The trial was repeated in 1930, and in 1931 and 1932 the first-cross Corriedale x Merino and Polwarth x Merino ewes of the 1929 and 1930 drops were also included, being mated with rams of the Corriedale and Polwarth breeds, respectively. The experiment will be continued this season also, by which time it should be possible to decide as to the relative merits of the two groups.

The 1932 Results.

The following details of the trial for the 1932 season confirm those of previous years and should enable New England farmers to form an opinion of the merits of the type of sheep concerned.

Seasonal conditions during 1932 at Glen Innes were quite good, except for the latter part of the winter, when feed became very scarce. During the autumn the sheep were in very good condition, and feed, though short, was quite ample for their requirements.

Mating took place from 20th April to 4th June, a period of six weeks and three days, the ewes mated being:—

To Corriedale Rams.		*To Polwarth Rams.*	
Merino ewes	107	Merino ewes	103
1929 Corriedale x Merino ewes ...	61	1929 Polwarth x Merino ewes ...	62
1930 Corriedale x Merino ewes ...	53	1930 Polwarth x Merino ewes ...	61
Total	221	Total	226

For about a month during the early part of the lambing the ewes were given a ration of ½ lb. of silage per head per day. By the middle of October the pastures were growing rapidly and the sheep began to recover the condition lost in the winter.

Drenching with bluestone and mustard was carried out at monthly intervals practically throughout the year. Prior to lambing, due to the sparseness of the feed, a number of cases of toxaemia of pregnancy occurred, but discontinued after hand-feeding with silage was started.

Particularly severe conditions occurred towards the end of September with heavy rain (over 5 inches) and cold winds. A total of ninety lambs died before marking, most of them during the cold snap mentioned above.

Particulars of the Lambing.

Lambing commenced on 6th September and continued till 31st October. Only five ewes required assistance. The lambs were marked on 8th November, and totalled 292 lambs, the details being as follows:—

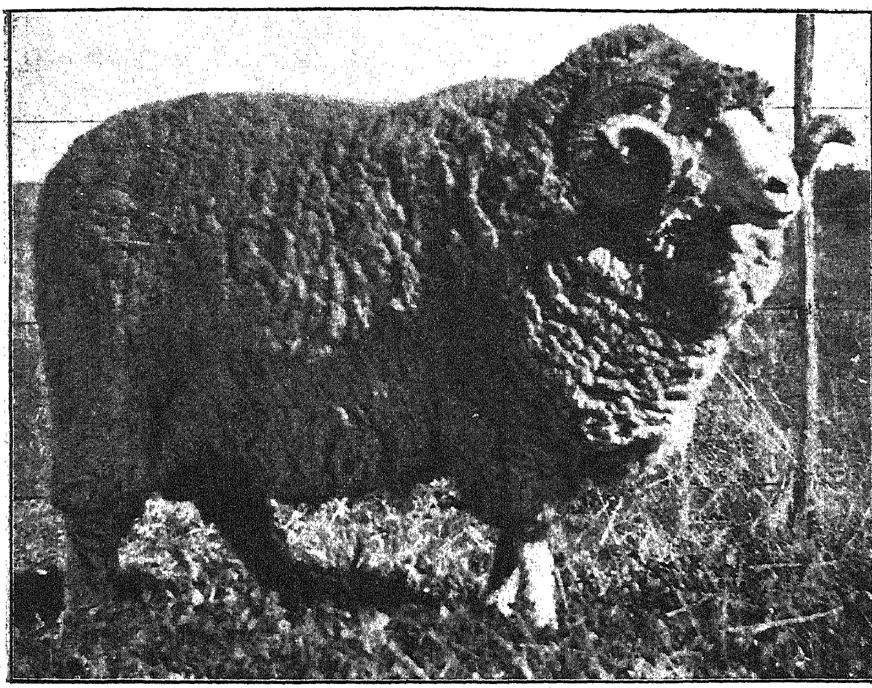
Rams.	Ewes mated.	Lambs marked.	
		No.	Per cent.
Corriedale	107 Merino	75	70
	114 Corriedale x Merino ...	68	58
Polwarth	103 Merino	70	68
	123 Polwarth x Merino ...	79	64

The Wool Results.

Shearing took place between 14th and 22nd November. To get over the disadvantage of handling a number of small lots the wool was, this season, put together and a record kept of the class with which each fleece was placed.

The percentage of fleeces of the different qualities was found to be:—

	56s	58s	60s	64s	66s
Corriedale x Merino	3·4	12·3	15·0	53·7	15·6
,, x Corriedale x Merino ...	...	11·2	16·6	61·1	11·1
Polwarth x Merino	...	1·1	6·7	60·4	31·6
,, x Polwarth x Merino	...	...	9·6	50·0	40·4



A Polwarth Ram Used in the Glen Innes Trials.

The average unskirted weights of the fleeces were as follows:—

Cross.	Fleece Weight. lb.	Cross.	Fleece Weight. lb.
Corriedale x Merino (1929 drop) ...	8·7	Polwarth x Merino (1929 drop) ...	8·5
,, x ,, (1930 ,,) ...	8·2	,, x ,, (1930 ,,) ...	8·4
,, x ,, (1931 ,,) ...	7·2	,, x ,, (1931 ,,) ...	6·4
,, x Corriedale x Merino (1931 drop)	7·0	,, x Polwarth x Merino (1931 drop)	6·3

The wool was comparatively finer throughout than last season, especially the Polwarth cross, but, as indicated by the sales, the wool of both crosses realised approximately the same prices. The wool was sold at Newcastle on 16th February, 1933, on a low market, the highest price realised being 11d. per lb. for four bales of A/CB.

The average net prices per head realised (after deducting selling costs, etc., totalling 4d. per lb.), were as follows:—

Corriedale Crosses.	s.	d.	Polwarth Crosses.	s.	d.
1929 drop (first cross)	6	3	1929 drop (first cross)	6	1½
1930 ,, ,, ...	6	3½	1930 ,, ,, ...	6	2½
1931 ,, ,, ...	6	5½	1931 ,, ,, ...	6	8½
1931 drop (second cross)	6	7	1931 drop (second cross)	6	6½
Average for 174 sheep	6	4½	Average for 200 sheep	6	4½

The sheep were inspected at various times and the Corriedale cross sheep are undoubtedly better grown and more even in appearance than the sheep of the other group. Even on the present low market the Corriedale cross sheep would be worth up to 1s. per head more than the others.

The Bacon and Pork Export Trade.

Mr. Charles Binnie, President of the Stockowners' Association of New South Wales, during his recent visit to England, made close inquiry into the pork and bacon trade of the United Kingdom and has supplied us with some particulars which again confirm the conflicting requirements of the local and English markets as regards bacon. Mr. Binnie noticed in the retail shops that the "streaky" bacon that is generally fancied in Australia was the cheapest, being priced at about 9d. per lb., whereas the heavily-fatted cuts from the gammon and back were most in demand and ranged in price up to 14d. per lb. Bacon or pork from Tamworth pigs was not favoured, that from the Large White being most sought after by the trade.

The differing tastes of the two countries is accountable for, to a great degree, by their dissimilar climatic conditions, the colder English climate favouring the consumption of comparatively fat bacon. Under the circumstances, it would appear that to meet the demands of both the overseas and local markets the pig-breeder in this country would have to raise two distinct types of baconers. At any rate, the Australian trade is at present well served by the Tamworth-Berkshire cross, bred back to the Berkshire or Tamworth.

The issues in connection with the pork export trade are not so confusing, although, as Mr. Binnie points out, the carcase most favoured is one between 70 and 80 lb. Maize-fed pork is not favoured in England, the fat being considered "tallowy." Pork from pigs fed on peas, beans, barley or wheat, however, is quite acceptable to the trade. Mr. Binnie draws particular attention to the potentialities of wheat feeding for pork production and suggests that pig breeding and fattening might, with profit, develop into more than a sideline with wheat growers, who, he claims, could get a return of 5s. a bushel for their wheat by marketing it "through" the pig.

A Promising New Blowfly Dressing.

R. N. McCULLOCH, B.Sc., B.Sc.Agr., Assistant Entomologist.

WHILE preparing, during 1931-32, new mixtures for trial as jetting fluids, the writer experimented with many larvicides by applying them to sheep already struck. The tests proved useful preliminaries to jetting trials on large flocks, and they also revealed that some of the preparations might be useful as dressings for struck sheep.

The opinion was formed that surface feeding insects like blowfly maggots should be susceptible to attack by means of stomach poisons, and that such poisons should offer more chance of lasting protection than could be hoped for from contact larvicides. It was seen that when blown sheep were dressed with suspensions of insoluble poisons such as Paris green and arsenate of lead, which by contact had no effect on the maggots, the latter would be killed out within a few hours. But it was also seen that such suspensions were in many cases unable to give lasting protection, because the deposit left by them either failed to adhere to raw surfaces or was washed away by the exudate from the wound. It was therefore considered that an arsenical paste should have advantages in this respect over a watery suspension. This point was discussed in November, 1932, with Mr. H. C. H. White, of Talbragar, Coolah, and the writer suggested to him the use of a suspension of Paris green in a thin paste of kaolin and soap solution. Mr. White made and used such a mixture and reported that it appeared to give very satisfactory results.

In the laboratory various fillers in different proportions were tried, and in April and May, 1933, Mr. White and also Mr. J. O'Brien, of Murrimbong, Gulargambone, generously allowed comparative tests on numbers of struck sheep. One paste used was made by mixing dry ½ oz. Paris green in 5½ oz. kaolin, placing the dust in a beer bottle and adding slightly less than one pint (18 oz.) of soft soap solution (1 or 2 per cent.), and shaking vigorously. In another paste boiled wheaten flour was used as a filler in the soap solution.

At Talbragar, on 16th May, 120 fly-struck ewe hoggets were crutched and dressed, in lots of thirty, with four mixtures. They were subsequently kept out of their flock for three weeks in a small paddock at the homestead. The mixtures used and the sheep found re-struck at subsequent examinations are set out below.

Dressing used.	No. of Sheep.	Date of Examination, and Sheep Re-struck.			
		20th May, 1933.	27th May, 1933.	9th June, 1933.	Total.
Paris green—kaolin paste ...	30	0	1 (slight)	1 (slight)	2
Paris green—flour paste ...	30	0	2 (slight), 1 (bad)	0	3
Zinc sulphate—5% in water ...	30	6 (slight), 4 (bad)	1 (slight), 1 (bad)	0	12
Monsol—5% in water	30	2 (slight)	1 (slight)	1 (slight)	4

At Talbragar also, on 19th May, of 101 young fly-struck ewes sixty-two were dressed with Paris green-kaolin paste and thirty-nine with a Paris green-kaolin-flour paste. When next examined on 9th June three sheep in each group were found re-struck.

At Murrimbong, Gulargambone, 100 young fly-struck ewes were dressed, in four groups, on 25th April. The mixtures used and the number of sheep found re-struck on 21st May are set out below:—

Mixture used.	No. of Sheep.	Sheep Re-struck Six Days after Dressing.
Zinc sulphate—5% in water	30	2 (slight) 3 (bad)
Paris green—kaolin paste	30	0
*Sheep dip—1 packet per 25 gallons (approx.)	24	4 (slight)
Copper sulphate—5% in water	16	1 (bad).

Note.—The sheep were not crutched before the application of the dip.

During the experiments the green fly, *Lucilia ouprina,* was attracted in numbers to struck sheep, though, on the whole, weather conditions were considered rather unfavourable to re-strike.

All dressings used, except the arsenical dip, were poured from bottles on to the wounds and rubbed in lightly with the fingers and the bottom of the bottle.

The Paris green-kaolin paste was found to wet the wool very well and to deposit on the wound and surrounding skin a much heavier film of toxic material than had been achieved by Paris green suspension alone. It had an apparently irritating effect on the maggots, though in some cases these were not all immediately driven from the wound.

The dry powder, left after the paste dressing, disappeared to some extent in a few days from the clean wool surrounding the wound, whereas a suspension of Paris green alone leaves a lasting colouration. This is an advantage, provided that toxic particles remain on moist parts susceptible to strike.

The paste made with wheaten flour was considered to penetrate and remain in the wool less well than the kaolin mixture.

On badly-struck sheep heavy scab formation followed the use of all dressings tried.

Experiments are in progress with the object of incorporating an oil and an antiseptic in the Paris green-kaolin paste.

The production of culinary herbs on a commercial scale presents possibilities in New South Wales. At any rate to grow sufficient for home use is an easy matter. Sowing can take place either in the spring or autumn.

Write to the Department for a copy of the recently issued leaflet on the cultivation of herbs.

Poultry Notes.

SEPTEMBER, 1933.

E. HADLINGTON, Poultry Expert.

Changeable Weather Causes Many Troubles.

DURING this month many troubles are usually experienced in the rearing of chickens, due partly, no doubt, to the rearing equipment becoming somewhat contaminated where chickens have been run in the same pens from the beginning of the season, but the chief cause is the changeable weather. What often happens is that a spell of warm weather is followed by a cold snap and the poultry-farmer is caught unawares. In other cases, as soon as the warm weather begins, either the chickens are removed from the brooders earlier than they should be or the brooder temperature is not maintained at the correct level, perhaps due to the earlier part of the evenings being warm and the temperature falling rapidly before the mornings. It should be realised that owing to the fluctuating temperatures during this month more care is necessary in handling the chickens than during the earlier months, and it is mostly some lack of attention that is responsible for many losses or unthrifty chickens at this time of the year, and until poultry-farmers get out of their minds the idea that good rearing results cannot be expected at the end of the season they will not attain the success they should with the later chickens.

Another factor responsible for much unthriftiness among chickens at this time of the year is that as the weather is beginning to warm up they are allowed to run out all the time, and the chilly easterly winds which often prevail in the afternoons at this period play havoc with them after the warmer temperatures earlier in the day. The detrimental effect of winds upon chickens does not appear to be sufficiently recognised, as it is common to see small chickens running out in biting winds, which results in their getting a chill, with the consequent drooping of wings and general ruffled appearance perhaps some days later. This applies to any part of the season, but when there is a wide variation in temperature the result is worse.

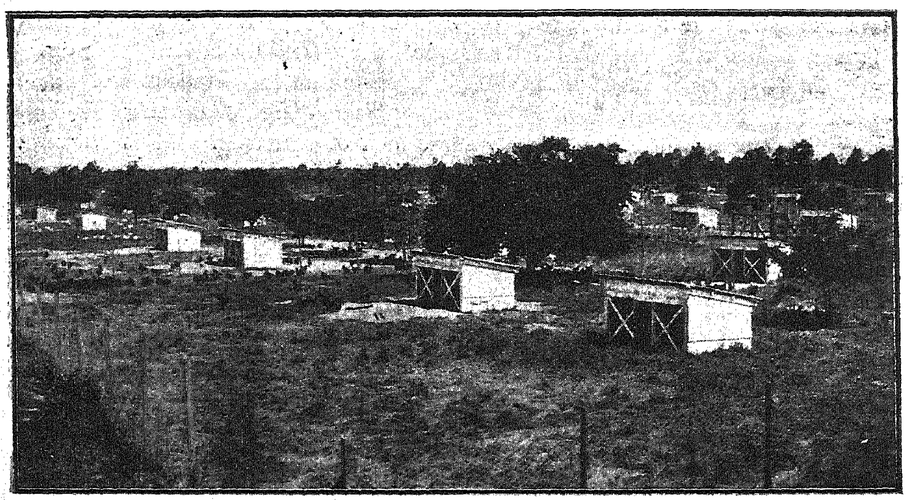
Finish Hatching Early.

MANY of those new to the industry may be tempted to prolong hatching operations beyond the end of this month in order to increase their flocks more rapidly or to make up for a late start, but such action is sure to lead to disappointment in most cases. The only circumstances which may justify prolonging the hatching a week or so later are in cases where the chickens are to be run on new ground all through the various stages of rearing and can be given free range on grassy runs.

The general experience with late-hatched chickens is that when the hottest part of the summer is reached they cease to grow and remain at a standstill for a couple of months until the cooler weather of the autumn commences, seldom developing as they should afterwards. Moreover, the pullets are much longer coming into production, and the cockerels, under present conditions, are not likely to pay for rearing. In view of this, those who have perhaps been successful in rearing small lots of late chickens should heed the advice given and not attempt to hatch on an extensive scale after the end of September.

Keep the Young Stock Growing.

THE main aim in the successful rearing of young stock should be to attain maximum development, and, although correct feeding plays an important part, if the environment is unsatisfactory the best of foods and feeding will not produce the desired results. Too often one sees fine sturdy chickens



The Colony System.

reared up to about three months old, and then, through lack of suitable accommodation, or through being left too long in small pens, they cease to develop, lose condition, finally sicken, and many waste away. It is then too late to restore them to normal condition again, and they are an economic loss.

The way to avoid this checking of growth is to give the young stock as much range as possible after they have learnt to roost, but it is useless giving a large area of run if big batches of birds are placed in one house, irrespective of its size. The most satisfactory method of rearing the chickens from the roosting stage on to maturity is on the colony system. This, of course, involves devoting a large area of land to this purpose, but the results amply justify such a course. To be effective the birds should

be housed in small batches of about fifty, and several houses can be erected in one large enclosure. A suitable size for such houses is 12 feet long, 6 feet wide, 6 feet high in front, and 5 feet at the back.

As a guide to the area of land required, a minimum of 100 square feet should be allowed for each bird. Thus, in a run of 150 feet long by 100 feet wide could be erected three houses of the size stated above, providing accommodation for 150 birds. If plenty of land is available a greater area could with advantage be allowed.

It is essential, however, to keep the birds confined in a small temporary enclosure around the house for at least a week after they are first put in, otherwise they will stray from one house to another, which results in overcrowding in some houses. Letting the birds out too soon, and also feeding them at a point nearest the entrance to the yard are the main reasons why some poultry-farmers do not meet with the success they should in working the colony system.

Rickets in Chickens.

During each chicken-rearing season cases come under notice where chickens are affected with so-called leg weakness, the main symptoms being a stiffness in walking, accompanied by a ruffled appearance and a general paleness of the affected birds, and, in advanced cases, they often fall over and gasp as if in pain. A close examination shows a definite curve in the beaks which become quite flexible and the bones in the legs are also soft and can be bent easily without breaking. This condition is known as rickets and is mainly due to a lack of sunlight or a deficiency of vitamin D in the ration. There are other factors, however, which appear to contribute to this trouble, chief of which are insufficient ventilation in the brooders, crowding together of the chickens to get warm, and the running of too many birds in the brooders.

In cases where chickens do not have access to direct sunlight, such as in battery brooders, or ordinary brooders where provision is not made to allow them to run outside in the sunlight after they are nearly a week old, it is advisable to add 2 per cent. pure cod-liver oil to the ration, whether wet or dry. With either system of feeding the oil should be mixed with the bran before the other ingredients are added. It is important that the mash containing cod-liver oil be fresh and should be prepared at least twice a week. Instances have been noted where chickens fed on a ration containing cod-liver oil which had been prepared for some time developed rickets, apparently as a result of the oil losing its potency. Where rickets are suspected the brooding conditions should be carefully looked into, and any faults such as outlined should be rectified. At the same time the chickens should be allowed into the sunlight if possible, without exposing them to cold winds, particularly in the case of those just taken from batteries; and cod-liver oil should also be used as mentioned previously until recovery is complete.

It should be borne in mind that chickens badly affected with this trouble, even though they may to all appearances recover normal health, receive a check in development which will never be regained.

Reserving Stud Cockerels.

POULTRY-FARMERS who do their own breeding will require to reserve cockerels out of the chickens hatched before this month so that they will be at least ten months old by the next breeding season. In many instances sufficient cockerels are not retained to enable a proper selection to be made when they come to maturity, thus inferior birds are often kept instead of the very best. It is necessary to reserve at least three times the number of birds that are likely to be required. These should be free from serious faults, which means that those showing any deficiencies should be marketed and those kept in reserve should be culled over to eliminate any that may develop faults at a later date. In this connection many birds which appear promising when they are young will be found to develop faults, or may become injured by the other birds before reaching maturity. The male bird plays a very important part in the quality of the progeny, not only from the point of view of breed character, but also in the maintenance and improvement of egg production. Thus every care should be exercised in the selection of male birds for future breeding. The fact that cockerels may be bred from some particular high-producing hen is no guarantee that they are going to be suitable for the breeding pen and just as much care is necessary in selecting from the progeny of such birds as from the ordinary breeding hens, otherwise deterioration may be expected.

A common error made by many inexperienced poultry-farmers is when selecting cockerels for breeding purposes they choose at an early age the sprightly, showy type of birds and reject those which are slower in maturing. These precocious cockerels appear very attractive to the novice, but actually the majority of them are the worst class of birds to breed from because they mature too quickly without attaining the necessary body development, whereas the "raw" type of bird at the same age is slower maturing, but develops into a stronger and more satisfactory bird for breeding from. It is necessary, of course, to discriminate between the well-grown large-framed birds and the slow-growing late-hatched ones, which are too long reaching maturity and are not suitable for breeding purposes.

The destruction of standing crops by floods at many centres on the North Coast during July supplies another argument for the conservation of fodder. Many dairy-farmers were depending largely on these crops for the feeding of their cows until pasture growth came away in spring and early summer. These farmers are now in a very unhappy position compared with those whose stores of fodder, even in the form of pit silage, remain unaffected by the recent floods.

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Agricultural Gazette of New South Wales.

Subterranean Clover.

WITH SPECIAL REFERENCE TO ITS VALUE ON SOILS OF RELATIVELY LOW FERTILITY.

J. N. WHITTET, H.D.A., Agrostologist.

DURING recent years Subterranean clover (*Trifolium subterraneum*), when periodically top-dressed (in the autumn of every year or at least every second year) with 1 to 1½ cwt. of superphosphate per acre, has demonstrated its value on the poorer types of country in the coastal and tableland areas of New South Wales, not only for providing a large bulk of feed, but for producing such feed on land that closely approaches a state of calcium and phosphorus deficiency.

Abundant Growth of Subterranean Clover.

The photograph gives some idea of the heavy growth that is made on soils similar to that of Crookwell samples (1), and (4) referred to on page 721.

Trifolium subterraneum is found growing naturally in Europe (from Holland southward)—where it was listed and figured in some of the earliest botanical works—northern Africa and western Asia to north-western India. It occurs thinly in dry, gravelly or sandy areas in southern and central England, and is fairly widespread but not abundant in pasture land. This species is also common in southern Europe as a roadside plant and up

western France to the Channel. It was recorded from Victoria in 1877, and identified in New South Wales in 1896 (*Agricultural Gazette* VII, 741).

The early plantings of this species in the grassland areas of the coast and tablelands of New South Wales were made on the better class lands. In coastal sections of higher fertility, however, where White clover (*Trifolium repens*) will thrive, it has been demonstrated that the use of a persistent and high-yielding strain of White clover, combined with efficient pasture management, will produce a greater bulk of feed throughout the year, and not have the smothering effect on other species of pasture plants as is the case with Subterranean clover.

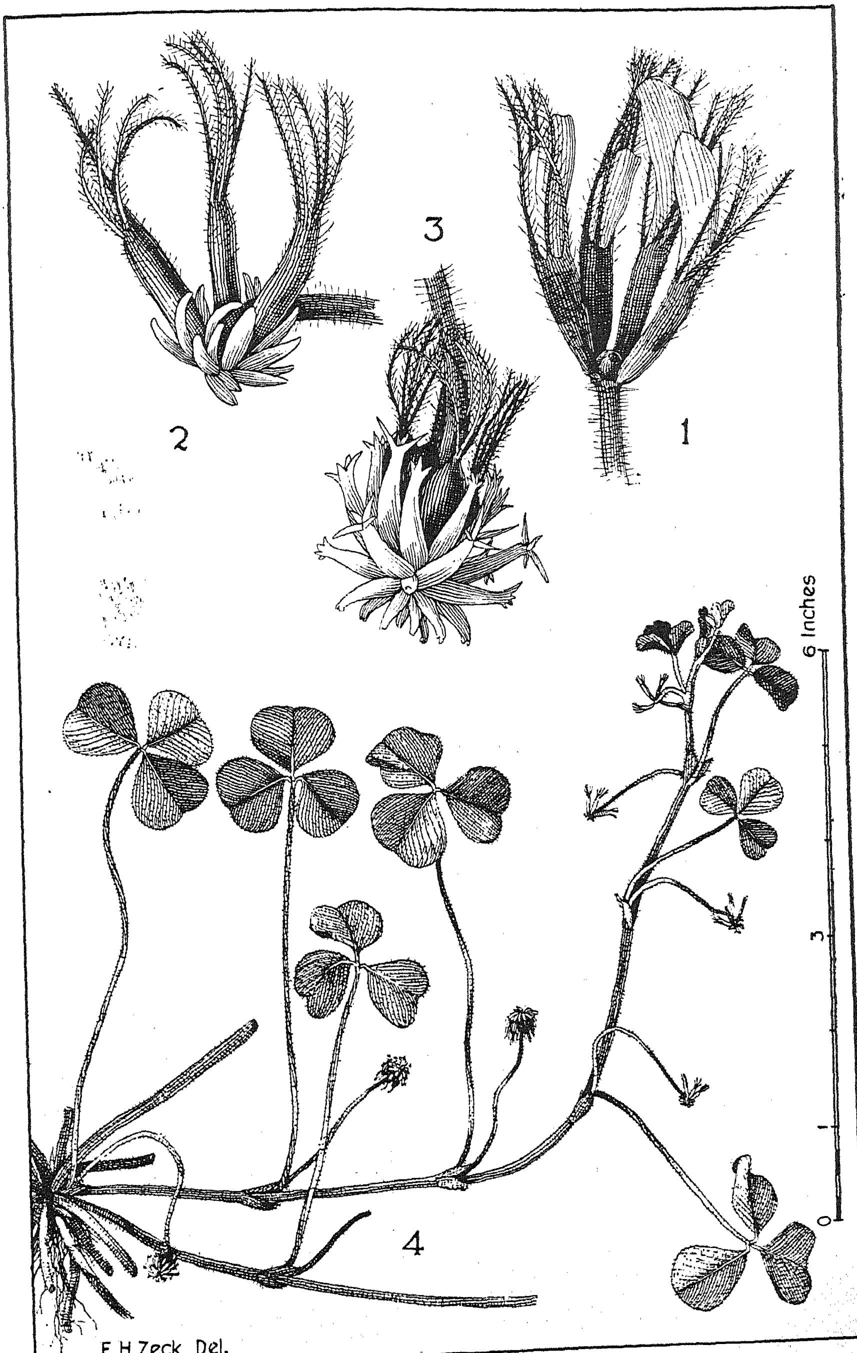
In the Tablelands and Slopes Divisions, *T. subterraneum* is being sown extensively, particularly where the average annual rainfall is not less than 22 inches; in districts of lower rainfall (down to 18 inches per annum) it is essential that most of the precipitation occur during the late autumn and winter months, as the plant is an annual, and its normal period of growth is from March to November. Good spring and early summer rains will prolong the growth of green feed longer into the summer, but after that period the plant dies off. Where, however, heavy growth has been produced, the dry material and seed pods provide good feed for stock during summer months. In many cases January or February rains will germinate a proportion of the surface seed, and on the Southern Tableland, in some years, green growth of the clover makes its appearance through the dry feed during these months.

Description of the Plant.

Subterranean clover is a self-pollinated, self-fertile annual with somewhat hairy leaves and stems. The flowers are white to cream-coloured, with a pinkish tinge, and as they become mature turn downwards towards the ground. The natural habit of the plant is to bury its seed pods as they form seed; this distinctive feature of the plant materially assists in preventing it from becoming eaten out of the pasture as stock graze the clover close to the ground, especially in a dry season. In very friable red soil loams this clover buries its seed pods ¼ to ½ inch deep. Where the plants have made a heavy top growth it is only those runners in close proximity to the ground that bury their seed pods, the remainder of the seed maturing above ground, falling from the pods as the latter disintegrate and germinating later on the surface of the ground.

Seedlings of Subterranean Clover and Burr Clover Compared.

In an average season the germinating period of the seed of these two species is coincident, but the young plants can be easily distinguished from one another. The leaves of the seedlings of *T. subterraneum* are narrower and more hairy than those of Burr clover (*Medicago denticulata*), and if the stems of these young plants are compared, it will be found that those of the Burr clover seedlings are white in colour, whereas those of Subterranean are reddish-green.



Subterranean Clover (*Trifolium Subterraneum*).

(1), (2) and (3) Flower structures. (4) Portion of the plant showing leaves, runners and seed pod formation.

Strains of Subterranean Clover.

As with all pasture plants, considerable variation exists within this species, and selection work has been carried out in the various States of the Commonwealth resulting in the isolation of early, midseason, and late strains. Since the species is self-fertile, no difficulty is experienced in keeping these strains pure.

The late strains are suitable for districts of good rainfall, whilst the early flowering types are of greatest value in localities where the winter rainfall is relatively low and dry periods occur during late spring months; the mid-season strains should prove useful in districts, suitable for Subterranean clover, between these two extremes.

Rates of Seeding and Top-dressing.

Where the clover is to be established on cultivated land the usual rate of seeding is 4 to 5 lb. per acre; if sown in a pasture seed mixture 1 to 2 lb. per acre is sufficient. On large areas pastoralists usually distribute 2 lb. of seed mixed with 1 cwt. of superphosphate per acre on the natural pastures without any prior harrowing or cultivation; establishment under these conditions is slower than where cultivation is carried out, but an effective sward is obtained at the end of the second year growth period.

Counts made in the departmental seed laboratory show an average of 80,000 Subterranean clover seeds per lb; where only 2 lb. of seed is sown per acre this will give, with even distribution, 16.5 seeds per square yard of surface soil. Where soil moisture conditions are satisfactory the plants should produce long runners with bulky top growth, and completely cover and thickly seed this area in the first season. This indicates that there is no need for heavy seedings per acre of this species.

In a number of instances reports have been received to the effect that, although the germination was satisfactory, the clover was not thriving where seed was sown on either cultivated or unworked areas. On investigation, the cause of poor growth has been found, in the majority of cases, to be the non-use of superphosphate as an annual or biennial top-dressing. It can be taken as a general rule that unless Subterranean clover receives 1 cwt. superphosphate per acre in the late autumn of each year or every second year, good growth and seed setting results will not be obtained.

Value as a Soil Fertility Improver.

One of the most valuable uses of this species is as a pioneer pasture plant on country of low fertility on the coast, tablelands, and parts of the Slopes. By its use the nitrogen and humus content of the soil is built up, and after the Subterranean clover has been established for five or six years, other higher-fertility-demanding perennial species of grasses and clovers, which are essential in pastures of high carrying capacity, can be incorporated in the sward. It is essential, however, on this country of poor fertility that the phosphorus requirements of *T. subterraneum* be supplied by the use of a readily-available phosphatic fertiliser such as superphosphate.

By its heavy production of fodder and consequent high carrying capacity on poor soils, under good pasture management conditions, this species has proved itself to be a most efficient utiliser of applied plant food.

Analyses of Soils and Pasturage.

To determine the nature of typical Subterranean clover soils and the growth occurring on them, chemical analyses were made of material obtained from a number of centres in the Southern Tableland Division.

The following table shows the results of the soil analyses expressed on a water-free basis:—

ANALYSES of Soil Samples.

Locality and sample No.	Reaction pH.	Soluble in 1 per cent. citric acid.	
		Lime (CaO).	Phosphoric acid (P_2O_5).
		per cent.	per cent.
Crookwell 1	4·3	·097	·0051
" 2	4·9	·174	·0027
" 4	4·4	·089	·0038
" 6	5·0	·161	·0037
Bombala 52	6·8	·091	·0020
Binda 63	7·6	·061	·0013

Soil samples Nos. 1 to 6 are heavy, white pipe clay loams; No. 52 is a greyish clay loam containing gravel; No. 63 is a greyish sandy loam derived from granite. Six samples taken to a depth of 4 inches were obtained in each paddock, and a composite sample submitted for analysis.

The analyses show that soils Nos. 1 and 4 are exceedingly acid and deficient in lime; Nos. 2 and 6 are strongly acid and not so deficient in lime as Nos. 1 and 4; while the pH of Nos. 52 and 63 may be regarded as very favourable to clover growth.

The phosphate content of No. 1 is moderate, whilst that of the remaining samples, and particularly No. 63, is approaching the point of phosphate efficiency. All of these paddocks (excepting Nos. 2 and 6—natural pasture areas) are growing Subterranean clover very satisfactorily, thus proving that this species gives excellent results on soils of low fertility.

Soil No. 1 was taken from a paddock in which Subterranean clover has been established since 1917; no fertiliser treatment was given for the first five years, but the area has been regularly top-dressed since with 1 cwt. superphosphate per acre every second year. In average seasons this paddock has carried three to four sheep per acre for most of the year.

Soil No. 2 was taken from a natural pasture area similar in soil type to No. 1. The average carrying capacity was one sheep per acre. Fertiliser treatment consisted of 1 cwt. superphosphate applied in 1929 only. (The botanical composition of the pasture of this area was similar to pasture sample No. 5.)

Soil No. 4 was obtained from a paddock on which 2 lb. Subterranean clover seed and 1 cwt. superphosphate per acre were sown broadcast amongst the natural pasturage in 1927 without prior cultivation; 1 cwt. superphosphate per acre was applied in each of the years 1928, 1930, and 1932. The carrying capacity was similar to that of soil No. 1. (The botanical composition is shown in pasture sample No. 3.)

Soil No. 6 was from a natural pasture area; soil type similar to soil No. 4; no fertiliser has been applied to this paddock. The average carrying capacity was one sheep per acre. (For botanical composition, see pasture sample No. 5.)

Soil No. 52 was from a paddock on which 6 lb. Subterranean clover seed and 1 cwt. superphosphate per acre were distributed amongst natural pasture in 1924; three additional applications of this quantity of superphosphate were made up to the period of taking the samples.

Soil No. 63 was obtained from an area on which 5 lb. Subterranean clover seed and 1 cwt. superphosphate per acre were sown broadcast amongst natural pasturage in 1927; this paddock had received three dressings of superphosphate, each of 1 cwt. per acre, up to the time of sampling.

Composite pasture samples were made up from herbage cut at six centres in each paddock, the material being gathered directly over the areas from which soil samples were subsequently obtained.

The botanical composition of the pasture samples was as follows:—

No. 3 Pasture Sample.—Subterranean clover 90 per cent., Soft Brome grass (*Bromus mollis*) 4 per cent., Giant Brome grass (*Bromus maximus*) 4 per cent., and Rat Tail Fescue (*Vulpia bromoides*) 2 per cent.

No. 5 Pasture Sample (Natural Pasture).—Wallaby grasses (*Danthonia* spp.) 20 per cent., Tussocky Poa (*Poa cæspitosa*) 20 per cent., Rat Tail Fescue (*Vulpia bromoides*) 20 per cent., Lesser clover (*Trifolium dubium*) 15 per cent., Soft Brome grass (*Bromus mollis*) 10 per cent., Giant Brome grass (*Bromus maximus*) 5 per cent., miscellaneous weeds 10 per cent.

Nos. 52 and 63 samples were each composed of Subterranean clover 100 per cent.

The analyses of the pasture samples, expressed on a moisture-free basis, were as follows:—

ANALYSES of Pasture Samples.

Locality and Sample No.	Crude Protein.	Phosphoric Acid (P_2O_5).	Lime (CaO).	Insoluble Ash (mainly Silica).	Soluble Ash.	Total Ash.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Crookwell 3 (from Crookwell 4 soil)	19·24	·43	1·29	3·46	6·65	10·11
Crookwell 5 (from Crookwell 6 soil)	9·07	·32	0·79	8·90	2·72	11·62
Bombala 52A (from Bombala 52 soil)	27·10	·73	1·15	*	*	9·73
Binda 63A (from Binda 63 soil)	17·17	·45	2·55	*	*	12·34

* Not determined.

The botanical composition of the natural pasture areas of Bombala and Binda is very similar to pasture sample No. 5; the superiority in feeding value over No. 5 of all three pasture samples from Subterranean clover swards is clearly shown by the analyses. This fact, together with the heavy carrying obtained from Subterranean clover, makes this species one of our most valuable plants for pasture improvement work, and particularly so for soil areas of low fertility located in the coastal, tableland, and parts of the slopes areas of New South Wales.

Acknowledgment.

The work of the following Departmental Analysts, in conducting the analyses and commenting on the results of same, has been of considerable value in the compilation of this article:—Messrs. M. H. Benjamin, D.I.C. (Lond.), A.A.C.I.; N. H. Parberry, B.Sc.Agr.; and C. M. Donald, B.Sc.Agr.

Periodic Use of Superphosphate Proved Best for Cowra Pastures.

A Trial to determine the relative merits, as a top-dressing for pastures, of heavy applications of superphosphate, gypsum and rock phosphate every few years, and of smaller, more frequent dressings of superphosphate, was commenced in 1929 at Cowra Experiment Farm, and has been continued to date.

The dressings which are being compared are:—

Superphosphate, 3 cwt. per acre every third year (1929 and 1932).
Superphosphate, 2 cwt. per acre every third year (1929 and 1932).
Superphosphate, 1 cwt. per acre every third year (1929 and 1932).
Superphosphate, 1 cwt. per acre every two years (1929 and 1931).
Superphosphate, 1 cwt. per acre every year (1929, 1930, 1931, 1932).
Gypsum, 3 cwt. per acre every third year (1929 and 1932).
Rock phosphate, 4 cwt. per acre every third year (1929 and 1932).

In 1932 the top-dressing was carried out on 23rd March, the pasture at that time, being green, with fresh growth as the result of copious rains earlier in the month. For the twelve months commencing March, 1932, the rainfall was 22.69 inches.

Observations made in June, 1932 (when the plots were fed bare), and again in August and October indicated that gypsum and rock phosphate were of no benefit to the pastures, and except that the rock phosphate plot appeared to have little more trefoil, these plots were similar to the no-manure plots, which consisted largely of saffron thistles, the remaining pasture being barley, fescue and spear grasses.

The application of superphosphate resulted in a big increase in both the quantity and the quality of the pasture. The 2 cwt-superphosphate-every-third-year plot carried from 100 to 400 per cent. as much growth as the no-manure plot, and the pasture mainly consisted of *Medicago denticulata* and *M. minima,* the remainder being barley, rat tail fescue and spear grasses, and only a few thistles. This plot was apparently as good as that to which 3 cwt. superphosphate was applied every third year. It appeared that 1 cwt. superphosphate per acre every second year was barely sufficient, and that 1 cwt. superphosphate every year, although resulting in a slightly better quality pasture, did not warrant the extra expense over 2 cwt. applied every three years.—A Pearson, Experimentalist.

How Championship Maize Crops are Grown.

Report on the 1932–33 Field Maize Competitions.

W. D. KERLE, H.D.A., Special Agricultural Instructor.

The field maize competitions, which culminate in the district championships promoted each year by the Royal Agricultural Society, afford an excellent opportunity of analysing the cultural methods of maize growers generally, and it is a noteworthy fact that improvement has always been apparent in centres where these competitions have been conducted.

Twenty-three entries were submitted for championship honours last season, competition being particularly keen in the South Coast and New England districts.

It is evident that there are certain major operations connected with maize-growing that could with advantage be given considerably more attention. Particularly is this true of disease control, soil preparation, and seed selection.

It has been demonstrated frequently and is evidenced in the winning crops in these competitions that early and thorough soil preparation has a pronounced influence on yield. Probably the greatest factor is the time of the initial ploughing. Trials carried out at Grafton Experiment Farm over a period of years show a difference of 15 bushels per acre in favour of early as opposed to late ploughing for maize. The advantages of permitting the ploughed land to fallow over the winter and thus subject it to the action of frost and other ameliorating influences cannot be over-estimated.

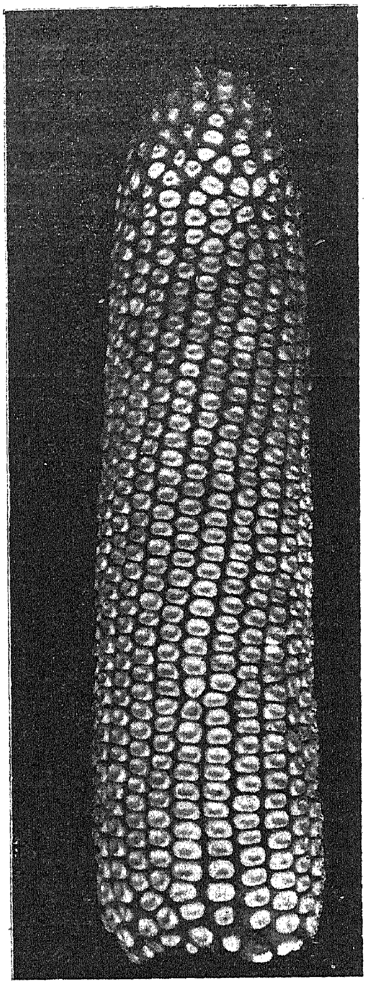
It is also evident that greater care should be exercised in the selection of seed maize. Field selection is apparently very little practised and barn selection methods leave much to be desired.

Intimately connected with seed selection is the problem of disease control, as it is patent that seed-borne diseases are on the increase. With regard to diseases in general, the nature of the "root, stalk, and ear rot" diseases is very apparent. These have no doubt developed chiefly from continuous cropping with maize, and a more systematic rotation is therefore advisable. Evidence of the benefit of lucerne and oats in this connection was supplied by the competition crops at Kyogle, and in the New England district respectively. These diseases are probably chiefly soil borne, and the thorough burning of maize stalks as early as possible after harvest can be recommended as an important measure of control.

South Coast Championship to Mr. Mitchell, of Eden.

The rivalry in this district was keen and covered a wide area—from Camden to Eden. The season, particularly from Moruya southwards, was an excellent one, a brief dry spell in January affecting only upland maize.

Rather unusually cold nights, however, somewhat delayed maturity. At Nowra and Camden the season was more erratic, being very dry in October and February and excessively wet in January; 13 inches were recorded for that month at Camden.



Leaming.
The variety with which Mr. A. L. Mitchell, of Eden, won the South Coast championship.

Mr. A. L. Mitchell, Lower Towamba, Eden, secured first place with a heavy crop of Leaming grown on rich alluvial soil on a well-protected bend of the Towamba River, and which periodically is enriched with flood silt. It had been cropped for fifty years with maize, which had been fed off to pigs, the inaccessibility of the holding militating against marketing the grain.

Soil preparation for this crop consisted of mouldboard ploughing deeply at the end of August, rolling and harrowing twice prior to sowing on 21st September. The single row maize drill was employed for sowing, dropping three grains every 20 inches in rows 3 feet 6 inches apart. Weed growth in the growing crop was controlled by twice harrowing prior to germination and four times scuffling and hoeing.

This crop was dense, even, and heavily cobbed. The individual ears were not big, owing to the closeness of sowing, but were well filled and very numerous. The type of seed was good, but could be much improved by selection.

Diseases were very much in evidence in the crop, as might be expected on land continuously cropped with maize for so long. Root rot was the most prevalent, although lodged stalks were not greatly in evidence, owing to absence of windstorms and the protected nature of the paddock. Ear rot was present, but in a minor degree compared to root rot.

Minor Placings go to Bega and Camden.

Mr. D. R. Gowing, Jellat South, Bega, secured second place with Funk's Yellow Dent. This was grown on a strong alluvial loam which had a little time previously been under lucerne. The ground had been well prepared by disc ploughing 9 inches deep in early August, at the end of September, and again in early October, being worked between ploughings with

the harrow and culti-packer. It was sown on 15th October with a double dropper in rows 4 feet 1 inch apart and two and three grains every 15 inches. The crop was a very dense one of uniform stand and free of weed growth. The type of seed was very good, but lacked uniformity. Root and stalk rots were the chief diseases, the former being the more prominent.

Mr. J. Bruchhauser, Camden, secured third place with a crop of Fitzroy of good type. It was grown on an alluvial loam soil which had been under maize the previous season and for twenty years prior to that under fruit trees. The ground was ploughed 9 inches deep in September, disced four times prior to re-ploughing, and rolled and harrowed several times before sowing in early November. Rows were 3 feet 6 inches apart and the plants 12 inches apart in the rows. Prior to sowing 180 lb. superphosphate per acre was broadcast. The crop was dense and well-cobbed, varying in thickness but heavy yielding. It was remarkably free of weed growth. Diseases were in evidence, chiefly smut and root rot.

RESULTS of the South Coast Championship.

Competitor.	Society.	Variety.	Cleanness of Cultivation. (Max., 20 points.)	Germination or Stand. (Max., 10 points.)	General Appearance and Condition. (Max., 10 points.)	Freedom from Pests and Diseases. (Max., 10 points.)	Purity and Trueness to Type. (Max., 15 points.)	Estimated Yield. (3 points per 10 bus.)	Total.
A. L. Mitchell ...	Eden	Leaming ...	19½	9½	9½	7½	10	40	96
D. R. Gowing ...	Bega	Funk's Yellow Dent.	19	9½	9	7½	11	36	92
J. Bruchhauser ...	Camden ...	Fitzroy ...	20	9	9	7½	12½	32½	90½
N. S. Bate ...	Bodalla ...	Fitzroy ...	18½	8	9	7½	12	33	88
W. J. Went ...	Pambula ...	Hickory King	17	9	9	8	11	33	87
E. A. Woods ...	Nowra ...	Iowa Silver-mine.	16	9	8	7½	10	34½	85
J. Keenan ...	Kangaroo Valley.	Hickory King	15	9	9	7½	7	35½	83
A. Cairney ...	Moruya ...	Fitzroy ...	18	9	9	8	10	24	78
W. E. Collins ...	Candelo ...	Hickory King	19	9½	9	7	9	15	68½

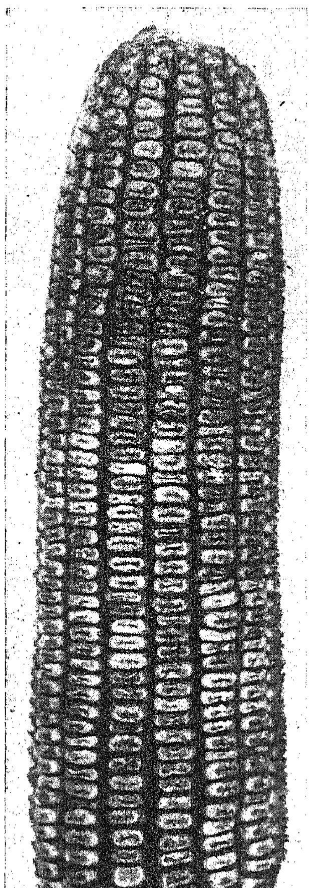
The North Coast Championship.

Seasonal conditions in this section were not particularly favourable. Spring rains were sufficient to ensure good germination and a satisfactory start, but summer rains were much below average and the crop received many severe checks. At Dorrigo, where the rainfall is frequently heavy during these months, it was much below the average.

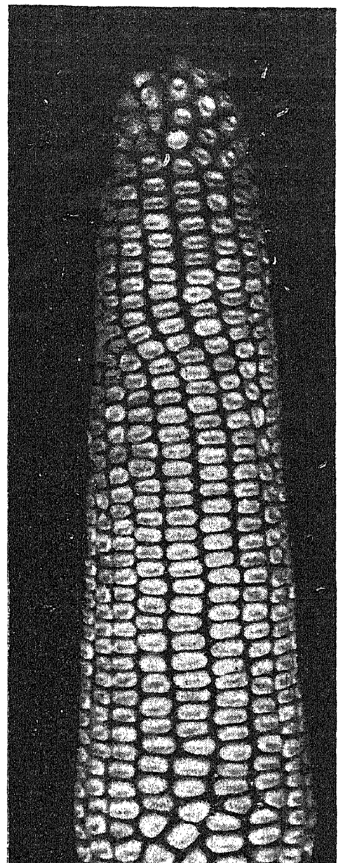
Mr. J. Campbell, Lynch's Creek, Kyogle, secured first place with an exceptionally even and well-grown crop of Fitzroy. It was conspicuous also for its absence of weed growth and slight disease attack. The seed was of very good type and the ears were well filled.

The sowing was made in the first week of December on a rich alluvial loam which had been cleared twenty-eight years previously. The crop prior to this one was oats, which followed a stand of lucerne five years old. This rotation is a very desirable one, and no doubt mainly responsible for the comparative absence of fungous diseases. The ground was disc ploughed

4 inches in September and twice springtoothed and harrowed before a second ploughing at the end of November. It was harrowed and springtoothed prior to sowing. Rows were 4 feet 6 inches apart, and three and four grains dropped every 3 feet.



Fitzroy.



Wellingrove.

Fitzroy also Placed Second.

Mr. W. H. Sharp, Fernmount, who secured second place, grew his crop of the Fitzroy variety on a strong alluvial loam soil which had been under crop many years, then under pasture and cropped again for four years, the last crop being potatoes. After ploughing out the latter early in November the ground was harrowed, later re-ploughed 7 inches deep, harrowed, and sown in mid-November in rows 4 feet 3 inches apart, single grains being dropped 10 to 12 inches apart in drills made with the plough. It was kept reasonably free of weed growth with the scarifier, and was hilled with

the plough. This was a strong-growing crop, but lacked uniformity in the stand, the seed varied considerably in type, and root stalk and cob rot diseases were fairly prevalent.

Mr. J. B. Grace, Paddy's Plains, Dorrigo, occupied third place with an entry of white maize of Giant White of fairly consistent type. It was grown on a basaltic chocolate loam typical of the best soil on the plateau, and had been cropped for four years, the last crop being potatoes. The soil is a very free-working loam, and preparation consisted of ploughing and harrowing in early November after the potatoes. Sowing followed almost immediately, rows being placed 3 feet 8 inches apart, and an average of two grains every 20 inches. The germination had not been even and weed growth not sufficiently controlled. Disease was very prevalent, chiefly root rot, and a barren condition of the stalks was also rather prominent.

RESULTS of the North Coast Championship.

Competitor.	Society.	Variety.	Cleanness of Cultivation. (Max., 20 points.)	Germination or Stand. (Max., 10 points.)	General Appearance and Condition. (Max., 10 points.)	Freedom from Pests and Diseases. (Max., 10 points.)	Purity and Trueness to Type. (Max., 15 points.)	Estimated Yield. (3 points per 10 bus.)	Total.
J. Campbell ...	Kyogle ...	Fitzroy ...	19	9	8½	8	11½	27	83
W. H. Sharp ...	Bellingen ...	Fitzroy ...	18	8	8½	7	10½	28½	80½
J. B. Grace ...	Dorrigo ...	Giant White	18½	8½	9	6	11½	21	74½
A. J. Noble ...	Casino ...	Fitzroy ...	19½	8	8	6½	10	21	73

The Central Coast Championship.

The Manning and Hawkesbury Rivers were the only districts that competed in this group, the entry from the Macleay River having been withdrawn. The Upper Manning Agricultural Society conducted its initial competition with much success.

The season here was similar to that of the North Coast section, the spring rains being satisfactory, but in the summer months the rainfall was below the average, and hot winds adversely affected growth and yields. In the Hawkesbury district flood rains did considerable damage to the mature crops. Under the circumstances the entries in this competition were remarkably good, and all crops exceeded 100 bushels per acre.

Mr. E. H. McLeod, of Mondrook, secured first place with a heavy-yielding crop of Manning White, sown on a rich alluvial loam which had been cultivated for many years, but had been repeatedly enriched by flood silt deposits.

The soil preparation had been thorough, commencing in July, and ploughing again later, employing the disc cultivator chiefly between ploughings and prior to sowing. Planting took place on 23rd October in rows 4 feet apart with two and three grains every 3 feet. The crop was well grown and heavily cobbed. The variety exhibited considerable

variation in type. A considerable amount of root and stalk rot was present, and a little ear rot, the latter chiefly as a secondary infection following insect damage.

The Minor Placings.

Messrs. A. W. and J. V. Andrews, Charity Creek, Wingham, entered a heavy crop of Leaming, sown on 5th November, in rows 4 feet apart, dropping two and three grains every 28 inches. This crop was the third after about twelve years pasture, and the soil a fertile alluvial loam. The first ploughing (9 inches deep) was given at the end of July, and the second at the end of October. The harrows were employed several times, and the soil was in excellent tilth at sowing time. This was a fairly even dense crop, reasonably free of weed growth and uniform for the most part. The seed was of very good type. Insect damage was noticeable, and there was a fair amount of root and stalk rot.

Messrs. May Bros., Pitt Town, were placed third with a heavy crop sown on a black alluvial loam which had been cultivated for many years, the last crop being beans. The ground was ploughed in June, and after harrowing and rolling was ploughed again, harrowed and rolled, and sown at the end of October. Rows were 4 feet 6 inches apart, three grains being dropped every 3 feet. Weed growth was rather too prominent, although the stand was uniform and growth strong. The variety was Golden Drop, a large-grained variety, very mixed in character, which Messrs. May Bros. have been growing for many years. Diseases were rather prevalent throughout.

RESULTS of Central Coast Championship.

Competitor.	Society.	Variety.	Cleanness of Cultivation. (Max., 20 points.)	Germination or Stand. (Max., 10 points.)	General Appearance and Condition. (Max., 10 points.)	Freedom from Pests and Diseases. (Max., 10 points.)	Purity and Trueness to Type. (Max., 15 points.)	Estimated Yield. (3 points per 10 bus.)	Total.
E. H. McLeod ...	Taree... ...	Manning White.	18	8	8	7	10½	35	86½
A. W. and J. V. Andrews.	Wingham ...	Leaming ...	18	8½	8	7	12	31½	85
May Bros. ...	Hawkesbury...	Golden Drop	16	9	8½	5½	10	31½	80½

The New England and Inverell Championship.

In this group the competition was very keen, and although the season was not conducive to high yields, the championship crops were of a high standard. Spring rains were heavy, and were followed by a dry December, towards the end of which month frosts were experienced which checked growth. In January further heavy rain occurred accompanied by hail, which in some localities did considerable damage. Dry weather followed up to maturity, but this did not check the crops, except in the Inverell district.

Estate J. Pedlow, Stonehenge, secured first place with a crop of Wellingrove grown on black self-mulching loam, which had been in cultivation, chiefly in rotation with oats, for twenty years. This rotation, coupled with early preparation of the soil, was chiefly responsible for the success of the crop. The initial ploughing was carried out in May, and the springtooth cultivator was used twice in August and the harrow twice in September. On 22nd October sowing was commenced with the double dropper in rows 3 feet 8 inches apart, four grains per hill. Weed growth was kept in check by harrowing twice prior to germination and four inter-row cultivations. The seed was of very good type, and showed evidence of careful selection. Fungous diseases were comparatively light.

Wellingrove also in Second Place.

Messrs. C. and E. Utz, Armidale, occupied second place with a nice crop of Wellingrove, which varied considerably in density and yield. It was sown on a grey loam soil with sandy patches scattered throughout. It had been out of cultivation for some years prior to maize last season. The mouldboard plough was used in early September to prepare for the crop, after which the harrow was used twice prior to planting on 10th October. Rows were 3 feet 4 inches apart, and three grains were dropped every 2 feet. There were a few rather bad patches of couch, otherwise the crop was reasonably clean. The seed was not pure and of a mixed type. Although diseases were not greatly in evidence, earworm damage caused a slight decrease in yield.

Mr. A. Cameron, Uralla, had a crop of Early Morn of fair type. It was sown in a red loam which had been cultivated for thirty years. The ground was ploughed in June, springtoothed in September, and harrowed. The date of planting was 16th October, the rows being 3 feet 6 inches apart and two grains dropped every 24 inches. This was an uneven stand, due to patchy germination, but it was very free of weed growth. Earworm damage was very prevalent throughout.

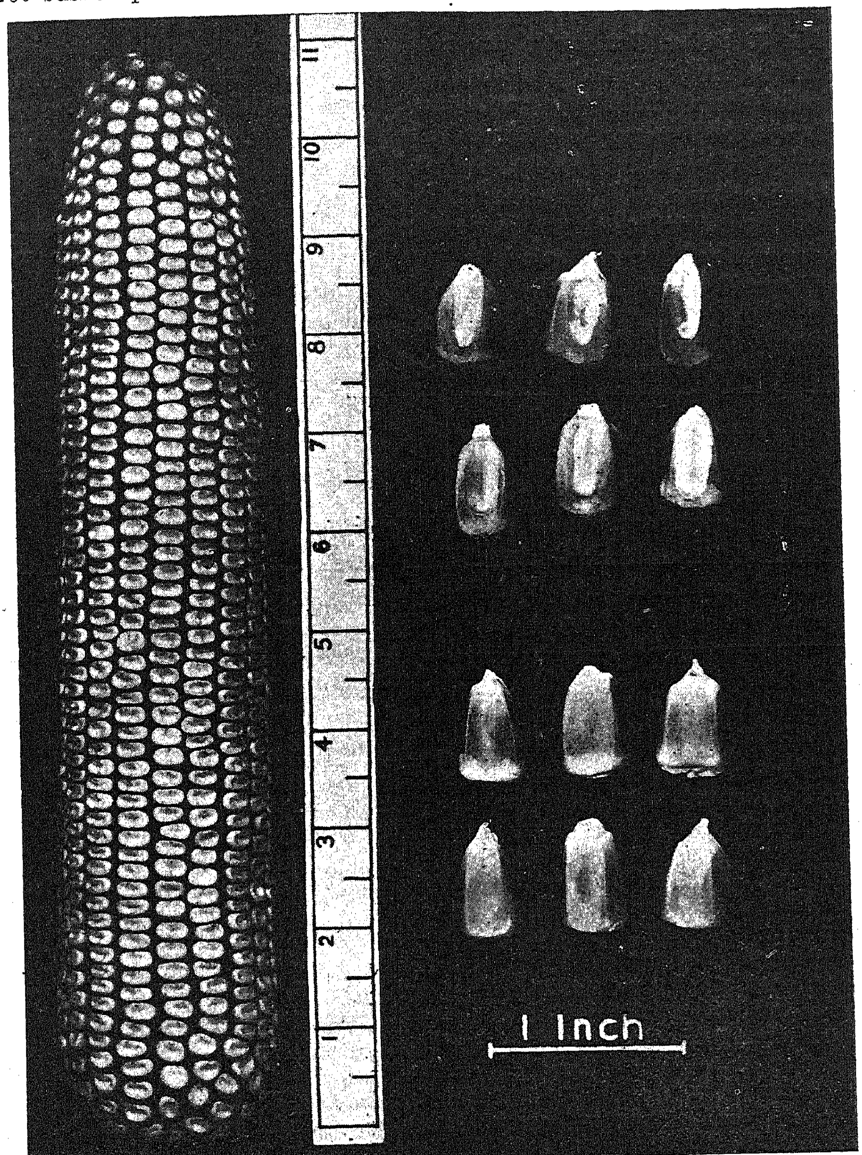
RESULTS of the New England and Inverell Championship.

Competitor.	Society.	Variety.	Cleanness of Cultivation. (Max., 20 points.)	Germination or Stand. (Max., 10 points.)	General Appearance and Condition. (Max., 10 points.)	Freedom from Pests and Diseases. (Max., 10 points.)	Purity and Trueness to Type. (Max., 15 points.)	Estimated Yield. (3 points per 10 bus.)	Total.
Est. J. Pedlow ...	Glen Innes ...	Wellingrove ...	18½	9	9	8½	11	36	92
C. and E. Utz ...	Armidale ...	Wellingrove ...	17½	8½	8½	8	10	37½	90
A. Cameron ...	Uralla ...	Early Morn ...	18½	8	8½	8	11½	28½	83
J. A. Duff ...	Tenterfield ...	Eureka ...	18	8½	8½	7	10	30	82
Boshier Bros. ...	Inverell ...	Funk's Yellow Dent.	17½	8½	8	7½	10	30	81½

The Tumut and Gundagai Championship.

While the season at Tumut was not much different to Gundagai, the crops generally at the former were poor, while at Gundagai river-bank crops were excellent. This was almost entirely due to the flooding which

these areas experienced in the previous winter. The nine crops in the local competition at this centre averaged 90 bushels per acre, and the winner of the championship, Mr. G. Elliott, had two entries which exceeded 100 bushels per acre.



Funk's Yellow Dent.
The variety which comprised the championship crop at Gundagai.

Mr. G. Elliott, Gundagai, secured championship honours with a crop of Funk's Yellow Dent. This was a very dense, even crop with well-filled ears. The seed was of good type. It was very free of weed growth, but

had a fair percentage of root rot. It was sown on a black alluvial loam which had been ploughed 8 inches deep in August, and well worked with a disc cultivator and harrow before sowing at the end of October. The rows were about 4 feet apart, and three and four grains sown every 2 feet 8 inches.

Mr. J. Butler, Bombowlee, entered a crop of Early Clarence, a variety which he has grown with success for some years. The soil is a strong alluvial loam which has grown maize continuously for many years, although the last crop was tobacco. At the end of October it was mould-board ploughed 6 inches deep, harrowed and rolled, and treated similarly again just prior to sowing on 20th November. The rows were 3 feet 8 inches apart, and three grains were dropped every 33 inches. The crop was prematurely ripened by a heavy frost in mid-March, which reduced the yield considerably. A slight reduction in yield also occurred as the result of root and stalk rot diseases and insect damage.

RESULTS of the Tumut-Gundagai Championship.

Competitor.	Society.	Variety.	Cleanness of Cultivation. (Max., 20 points.)	Germination or Stand. (Max., 10 points.)	General Appearance and Condition. (Max., 10 points.)	Freedom from Pests and Diseases. (Max., 10 points.)	Purity and Trueness to Type. (Max., 15 points.)	Estimated Yield. (3 points per 10 bus.)	Total.
G. Elliott ...	Gundagai ...	Funk's Yellow Dent.	18½	9	9	7½	12	63	119
J. Butler ...	Tumut ...	Early Clarence	19½	8½	7	7	12	36	90

POTATOES FROM FROSTED CROPS MAY BE USED AS SEED.

MANY potato crops have been frosted during the past season, and the question has cropped up in more than one quarter as to whether the "immature" tubers from these crops would be suitable for seed for the next crop.

Generally speaking, this immature seed is quite satisfactory, provided, of course, that it, in turn, came from a crop grown from seed of good stock. Furthermore, the same procedure of selecting seed only from the highest yielding plants should be carried out with the frosted crop just as would have been done had the crop escaped the frost and come to maturity. In the case of crops that were well advanced towards maturity before being frosted, rigid selection along the lines suggested is very necessary, as under ordinary circumstances even the poor types of plants in such crops would have produced at least some seed-sized tubers. On the other hand, crops that were planted, say, in November and frosted in January would very likely only have seed-sized tubers on the best plants, while many of the poor types would have produced no tubers at all, or at best only very few would be carrying tubers of seed size. Thus in these immature crops nature has already done the selecting to a large extent, and this explains why immature seed is often superior to that obtained from a mature crop, as in the latter case there is greater room for error to creep in during the work of selecting.

Lucerne on Sandy Soils at Binnaway.

INCREASES CARRYING CAPACITY MORE THAN TENFOLD.

G. NICHOLSON, H.D.A., Senior Agricultural Instructor.

The success of Mr. W. Duggan, of Oak Valley, Gamble Creek, with lucerne as pasture on poor light sandy soil may be taken as typical of what is possible on similar soils in that portion of the State traversed by the Mudgee-Gwabegar line. The carrying capacity of Mr. Duggan's property while unimproved was reckoned at a sheep to 10 or 12 acres, but when improved and laid down to lucerne it is capable of carrying three sheep to the acre.

Lucerne as Permanent Pasture.

IN recent years large areas of lucerne have been established on the tracts of poor light sandy soil between Mudgee and Gwabegar. When unimproved these soils are practically useless, and even when prepared for cereal crops they are not over-productive. For both grazing and hay, lucerne has proved very adaptable on this class of country, and when laid down as a permanent pasture it has proved vastly superior to any other introduction.

Mr. Duggan arrived at Gamble Creek in September, 1928, and took over a block of 1,037 acres, only 50 acres of which was cleared, the remainder being heavily timbered with apple, ironbark, gum, yellow box and pine. Working practically single-handed, he has cleared and cropped 450 acres within the space of four years. The soil over the major portion of the property is a deep light sandy loam of rather unattractive appearance and poor quality. The natural grasses and herbage are coarse and unpalatable, and three-awn grass predominates. In the light of present experience the soil can only be regarded as second- or third-class country for wheat production. However, if suitable cultural methods are adopted, light-yielding crops are assured in practically all seasons, though wet years are unfavourable.

At Oak Valley farming operations have been confined to the growing of wheat, oats, and lucerne, and with the last-mentioned crop excellent results have been achieved. Commencing in a small way in 1930, 18 acres of lucerne were sown at the rate of 8 lb. per acre. The result justified an expansion of the area, and in 1931, 40 acres were sown, but, acting on the Department's advice, the rate of seeding was reduced to 3 lb. per acre. This lighter seeding has proved to be ample, and the density and uniformity of the stands is all that could be desired. In 1932 an additional area of 155 acres was sown, and this year a further 100 acres, which brings the total area of lucerne to over 300 acres.

Lucerne Grown with a Cover Crop.

Various methods of seeding have been followed—broadcasting, and sowing with a combine drill, alone and with a cover crop of wheat or oats. Except when conditions are ideal, broadcasting or shallow sowing does not

give a satisfactory germination. The most successful method is to sow through the grain tubes, placing the seed in direct contact with the soil moisture. It has been proved that the most economical method of establishing lucerne is to sow it with a cover crop. Tests conducted in 1932 indicate that no difference in the density or vigour of the resultant stand was discernible between lucerne sown with or without a cover crop. Last season an area of 150 acres was sown with 31 lb. wheat and 3 lb. lucerne per acre, and an excellent grazing stand of lucerne was obtained. To avoid having to cut hay tracks, strips through the paddock were sown with lucerne only, but at present the lucerne (alone) does not show any better growth than the remainder of the stand. Good grazing stands of lucerne, which under average conditions will last for five to seven years, can be established at the small outlay of 2s. to 2s. 6d. per acre.

During flush periods Mr. Duggan has cut hay of good quality. Furthermore, the district is proving most suitable for seed production. Excellent seed samples have been harvested at Oak Valley. Using an old harvester, up to 100 lb. seed per acre has been obtained. This is a cheap and easily available method of harvesting the seed, but is, if course, wasteful.

Three Sheep to the Acre.

The carrying capacity of the property when unimproved is assessed at one sheep to 10 or 12 acres, when cleared one sheep to 2 acres, and when under lucerne three sheep per acre. During the recent dry spell, when natural feed was scarce in the district, the feed problem at Oak Valley at no time became acute, and fat stock were sold off the property. The deep sandy loam responds quickly to rain, and good grazing is available for nine months in the year. Even during the winter months when lucerne is normally regarded as dormant, its grazing value is much superior to the natural pastures. Mr. Duggan supplements the winter feed by sowing wheat and oats for grazing.

The transformation that has taken place on this poor country should encourage other farmers in this district to improve their light sandy soils for grazing and retain the areas of cultivable, better-class soils for cereal production.

To Control Weeds in the Lucerne Crops.

The method of keeping spring weeds in check is to mow frequently. The mower should be put over the lucerne crop before any of the weeds have commenced to flower, and the operation should be repeated a month or two afterwards. Two mowings will generally be sufficient. They must not be omitted if weeds are getting a foothold, even if the lucerne is not ready to cut, as the object is to destroy the weeds. If the quantity should warrant it, the cut material can be raked for green feed or for silage.

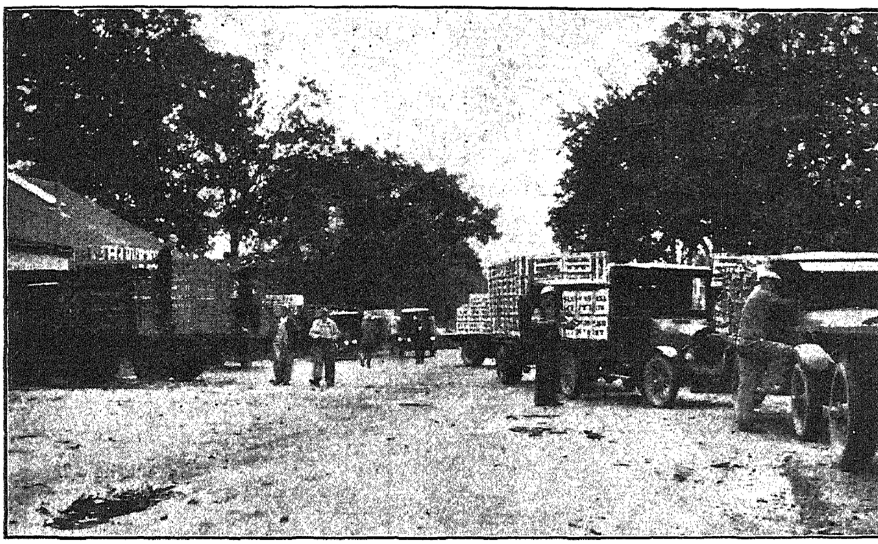
Cauliflowers.

More Appreciated Here Than Abroad.

JOHN DOUGLASS, H.D.A., H.D.D., Senior Agricultural Instructor.

All-the-year-round Production in America.

CAULIFLOWERS are a more popular vegetable in Australia than perhaps in any other country in the world. The reason is to be found in the fact that they are only available to the consuming public in this country for a limited period each year, whereas to the consumers in Europe and America cauliflowers are available all the year round. Furthermore, these countries have such a wide range of succulent vegetables to appease their vegetarian



The Cauliflower Auction Mart at Riverhead, N.Y.
The photograph shows portion of a mile-long line of trucks, which pass a central point where buyers operate.

appetities that the cauliflower is only one among many, whereas from our point of view it has few serious rivals as regards succulence and palatability.

There is such a wide range of climate in the fertile portions of the United States that all-the-year-round production of cauliflowers is not at all difficult. For instance, in the more fertile parts of the cooler States (Eugene, Washington, and the Katskill Mountains near New York, for instance), growers specialise in the production of summer cauliflowers. In the warmer States, of which California is typical, growers take advantage of the climatic conditions to specialise in winter cauliflowers.

High-grade Seed at Any Cost.

Long Island, in the State of New York, is one of the most important cauliflower growing centres in U.S.A., and I made the most of my opportunity whilst in that locality to gather all the hints I could that would be of use to Australian growers. After many years experimenting, Long Island growers had to admit that their short summer period precluded the growing for seed of the varieties most suited to their district. Consequently they now obtain their seed from Europe, and so seriously do they regard the question of high-grade seed that at various times they have commissioned a representative to visit Denmark and select seed from growing crops.

The Danes perhaps lead the world in cauliflower seed production. They take elaborate precautions to ensure success, their stud plants being grown in pots in glass-houses. Some of the Danish varieties of cauliflowers should prove suitable for our conditions.

Growers in the warmer States also pay particular attention to seed selection, and as Australian conditions most nearly approach those of these latter States, many of their practices could be adopted here. One thing that was particularly noticeable was that the seed crop is grown as quite a distinct crop from the commercial "head" crop. The seed crop is planted from the very best selected stud seed, the sowing being made at a time that will enable it to produce heads during a period when they will not be damaged by frost, snow, and other adverse conditions The seed plants are grown close together, and are selected as to suitability of type at the time when the "heads" would normally be cut for market. By following this plan, the plants which fail to come up to the standard for seed production can be cut and marketed as "heads." The American grower aims to select a small round head, with pure white curd well protected, and with plenty of depth. Uniformity in maturing is considered of prime importance.

American Cultural Methods.

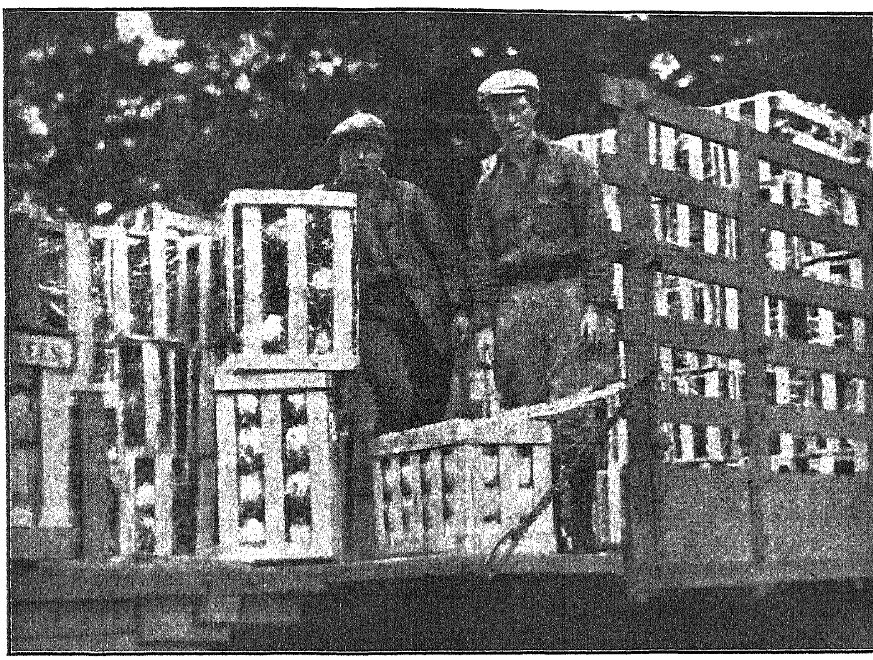
The methods employed by the growers in Washington State will serve to illustrate the practices of the specialist cauliflower growers in U.S.A.

The soil in Washington State varies considerably in nature, and much of the irrigated lands on which cauliflowers are grown compacts very solidly after watering. This often results in faulty germination, and as sufficient organic manure is not available to ameliorate the soil conditions, even of the seed beds, other means have to be resorted to so as to ensure a good germination. By far the best results are obtained by mixing the cauliflower seed with radish seed. The radish seedlings being very robust, force their way through the compacted surface soil, making way for the weaker cauliflower seedlings.

The seed is invariably sown in rows 6 inches apart in the seed-beds; this ensures sturdy seedlings. Insecticidal dusts are used in the seed-beds and during the early stages of growth in the fields to combat insect pests. The

cauliflower fields are always cultivated to a depth of at least 1 foot, as the growers realise that the crop is a heavy feeder and therefore requires considerable root room. Lime is very extensively used during the preparation of the soil, mainly as a precaution against disease. Contrary to the practice in this country, many U.S.A. growers plough half the dressing of lime into the soil, subsequently broadcasting the remainder on the surface, and then giving a further cultivation to distribute the lime as evenly as possible throughout the soil to the depth of ploughing.

The crop is grown on such a large scale in parts of America that the rather extensive use of special machines becomes economical. Many different types of transplanting machines, for instance, are used. These machines



The Type of Crate Used in the American Cauliflower Trade.
The flat crate in the centre foreground has a hinged lid and is used for Brussels sprouts.

not only set out the plants very uniformly, but also water them and mulch the surface soil. Heavy applications of complete fertilisers are considered essential to aid in the production of that comparatively small, clean, white head so much favoured by the consumers in U.S.A. And this characteristic has been kept to the fore when breeding improved varieties of cauliflowers.

Better Marketing Methods.

Some points in American growers' marketing methods are of interest. The cauliflowers, after being cut in the field, are carted to a central packing house, where most of the heavy leaves are cut off and the remaining ones neatly trimmed to expose the heart to best advantage. In this way, freight

or cartage (sometimes both) on many tons of useless leaves, which only hide the true worth of a good "head," is saved. The trimmed heads are then graded according to colour and size. The highest grade American cauliflower is from 2 to 4 lb. in weight, and free from defects. A "head" of this size is just sufficient for one meal for an average family.

The cauliflowers are packed in crates (see illustration) which hold from twelve to eighteen, and they are so arranged that the hearts can be readily examined through the open slats of the crate.

Preventing Whip-tail in Cauliflowers.

Whip-tail, which is one of our major troubles, was also at one time a most serious problem in the cauliflower fields of Long Island. As in New South Wales, however, they discovered that the condition could be prevented to a very large extent by supplying sufficient lime to the soil to keep the soil acidity within fairly well defined limits—pH. 5.5 to 6.6. In the experiments at Long Island lime was applied in varying amounts from 500 to 4,000 lb. per acre, and it was shown that the trouble decreased as the amount of lime applied brought the soil acidity within the range stated. On the other hand, when sulphur and sulphuric acid—substances which would tend to make the soil more acid—were added to the experiment plots, the percentage to whip-tail increased.

Another interesting point about whip-tail is that certain varieties both in Australia and America show marked resistance to the trouble. Plant breeders abroad are exploring the possibility of using these varieties to breed totally whip-tail resistant cauliflowers. Berlin Forcing is one variety that showed marked resistance in trials conducted at Long Island.

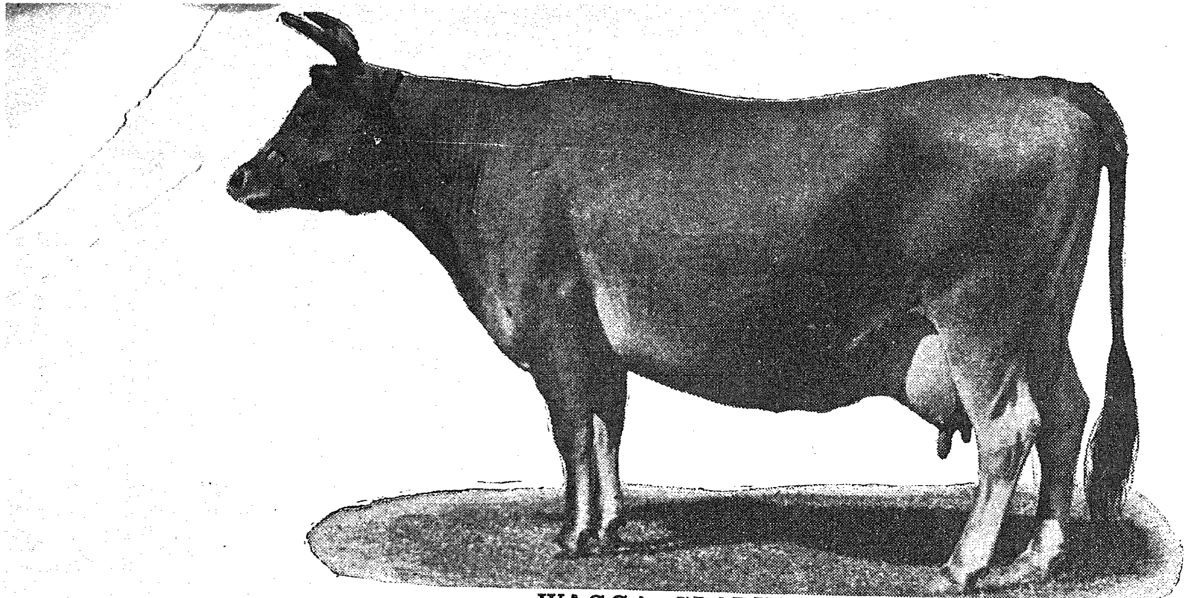
How to Make Neatsfoot Oil.

The following simple recipe for the manufacture of neatsfoot oil may be appreciated by farmers in view of this oil's value in keeping harness in good order.

Neatsfoot oil is made by boiling in a suitable receptacle the feet and leg bones (up to the knees) of well-grown cattle. The material should first be thoroughly cleaned by scalding and scraping them free from hair, dirt, etc.; it should then be covered with water, which should be brought to the boil and then allowed to simmer for about two hours. After the oil has risen to the surface it should be skimmed off and the mixture boiled again, and a second skimming made.

The oil thus secured should be strained through a piece of cheese-cloth in order to extract pieces of flesh, etc., from the mixture, and the strained product should then be boiled again, great care being taken that it does not catch fire. Finally, it should be strained again, cooled, and bottled. Pure neatsfoot oil should be light-lemon in colour.

The method described is for manufacture on a small scale; manufacture for trade purposes necessitates the use of a much more detailed and tedious process.



WAGGA GLADYS (7778).

The following are the Herd-testing Records of some of the Cows in Departmental Herds:—

Jersey Cow: WAGGA GLADYS (7778). This cow holds a world's record for butter production for the Jersey breed—22,847 lb. milk, 1,517 lb. commercial butter in 365 days. Awarded Champion Ribbon, Peter's Prize, R. A. Show, 1928. *Guernsey Cow:* WOLLONGBAR PARSON'S RED ROSE 20th (730). Holds a world's record for butter production for the Guernsey breed—17,252.5 lb. milk, 1,302.62 lb. commercial butter in 365 days. *Ayrshire Cow:* MISS DOT OF GLEN INNES (3760)—19,562.5 lb. milk, 1,088.64 lb. commercial butter in 365 days.

The Department has for sale young bulls from tested dams of the following breeds:—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

For further particulars apply to—The UNDER SECRETARY, Department of Agriculture, SYDNEY.

New England Potato Competitions.

Results of 1932–33 Local and Championship Contests.

G. C. SPARKS, H.D.A., Manager, New England Experiment Farm.*

Very material advantages in regard to both quality and quantity of their product, have accrued to potato growers in the southern and western districts from participation in crop competitions during the past few years. In 1932-33, three New England societies, viz., Guyra, Glen Innes and Armidale, also organised competitions, and the Royal Agricultural Society promoted yet another championship contest.

The outstanding weakness of northern potato culture would appear to be the method of seed selection, it being unusual to find selection going further back than the barn. The production of pure seed, of correct type, disease-free, and of high-yielding capacity can only be expected when intelligent hill selection is practised, and this aspect as well as many others of interest to New England growers, is discussed in the following report on this year's competitions.

THE past potato-growing season in New England was marked by extremes. Excellent growing conditions were experienced right into January, when heavy and continuous rains caused some concern for the safety of the crop. February brought a period of cold, cloudy weather, which enabled the soil to get rid of excessive water without injury to the crop, but from this time until the end of the growing period very dry weather prevailed, which seriously depressed yields and made the way easy for moth attack. The Armidale district rainfall for the October-April priod, which was typical of the bulk of the area affected, was as follows:—October, 393 points; November, 436; December, 177; January, 787; February, 75; March, 26; April, 124 points.

Potato moth was very prevalent all over New England, and an immense amount of damage was done. The dry, hot autumn weather provided conditions favourable to moth attack, as the cracking of the soil gave free access to the tubers. Shallow-bearing sorts, such as Factor, were badly damaged, but a very notable exception was the champion crop, where deep planting and good cultivation had overcome the difficulty.

Virus disease in various forms was present in most of the crops, but in no case was the infection other than very slight, and growers generally are well informed regarding this aspect of potato culture, and are taking all reasonable precautions against spread. A little common scab, eelworm, and rot were also observed. Common scab will yield to seed treatment—immersion in mercuric chloride solution—and eelworm to fallow and rotation of crops.

* Mr. Sparks judged these competitions.

The fundamental weakness in northern potato culture would appear to me to lie in the technique of seed selection. It is very unusual indeed to find seed selection going further back than the barn, and although under this system due consideration can be given to type and shoot strength, it is quite impossible to produce seed of the highest and most desirable type. One is a little diffident in suggesting drastic change in established local practice, but elsewhere hill selection of seed potatoes has proved so successful that it would appear that the adoption of this system as a regular routine in this district could only have the most beneficial results. The production of pure seed of correct type, disease-free and high-yielding, can be expected to follow intelligent hill selection, and only by this method can the spread of virus diseases be definitely checked and the progeny of undesirable strains eliminated. Even under the most favourable soil, tillage and climatic conditions, capacity yields are impossible unless the best type of seed is used. The most approved method of popular seed improvement is to secure small parcels of seed of the most desirable varieties of potatoes from the best possible known source, and with these to plant isolated seed plots, which are in turn kept free of virus diseases by the prompt removal and destruction of diseased plants. From these areas, hill selection of the best plants to provide seed for next season's seed plots can be made, and the residues used for bulk sowings. The common practice of purchasing seed from unknown sources must almost inevitably result in spread of disease, the production of undesirable characteristics, and depression of yield.

A New Championship Contest.

DURING the past season the first field potato championship promoted in New England by the Royal Agricultural Society was conducted. Each of the three potato-growing districts, viz., Guyra, Armidale, and Glen Innes, were represented.

The points awarded in this championship competition were as follows:—

AWARDS in the New England Championship Competition.

Competitor and Society.	Variety.	Yield per Acre.	Points Awarded.						
			Yield (5 points per ton.).	Quality.		Freedom from Disease.		Purity.	Total.
				Appearance.	Cutting.	Tops.	Tubers.		
		t. cwt.							
R. J. Fitzroy, Guyra ...	Factor ...	10 10	52½	13½	13	7	6½	14	106½
E. G. Scott, Glen Innes...	Symington ...	7 17	39	13	13	7	6	13	91
R. Rowlings, Armidale...	Queen of the Valley.	3 13	18	12	13	6½	6½	12	68

Mr. Fitzroy's winning crop of Factor yielded 10½ tons per acre. It was grown on "Carawatha," at Brockley, on a chocolate basalt soil cropped for the first time. The land was mouldboard ploughed 5 inches deep early in October, 1932, harrowed and cross-harrowed; cross ploughed and harrowed late in November and sown on 26th November. The crop was harrowed on 6th December and later hilled lightly by scuffler. The bulk of the area was sown with whole seed (2 to 3 oz. sets), and the residue with table-sized potatoes cut into 2 or 3 oz. sets. No manure was used. The crop was very free from disease—a very light infection by mosaic and leaf roll being shown in the tops and a trace only of scab in the tubers. Moth damage was almost nil, deep planting (5 inches), friable soil and thorough cultivation providing good protection for the tubers. The relatively close spacing of the rows was an important yield factor the distance apart being only 30 inches (26 to the chain) whereas the average of all other entries was 32 inches. The crop was very pure and true to type.

Mr. Scott's crop of Symington was on chocolate basalt under cultivation for the past forty years. For this crop the land was ploughed in May, 1932, cross-ploughed in July, springtoothed in early October and planted by machine on 20th October. The crop was harrowed in early November, scarified in mid-November and early December and hilled on 7th January. Whole seed was used, the sets being upwards of 3 oz. in weight; no manure was used. The crop yielded 7 tons 17 cwt. per acre, and while a point was lost to the winner as regards type and purity, on all other counts except yield there was little to choose between them. This crop made very strong and even growth and flowered profusely.

Mr. Rowling's crop of Queen of the Valley, awarded third place, was on a black basalt loam cultivated to potatoes, maize and oats for four years previously. The land was ploughed in July and again in November and the crop planted on 14th November. This crop lost two points to the winner for purity, due to the presence of plants of other varieties, and carried a little more virus disease in the tops, but otherwise was quite satisfactory. Mr. Rowlings' entry was the only one submitted for final judging in the Armidale competition, and consequently no report is given in this issue of a local contest.

The Guyra Competition.

In the initial field potato competition promoted by the Guyra society there were originally thirty-two entries, but owing to very unfavourable weather during the later portion of the growing period only twenty-two completed. The following varieties were represented:—Factor (eight entries), Coronation (five entries), Satisfaction, Dakota Red and Jones' Success (two entries each), Manhattan, Mount Gambier and Northern Star (one entry each). Considerable interest seems to be centred in Jones' Success which is also known as "Jones' Factor," and which is being quite widely grown about Llangothlin and elsewhere. It is, I understand, a selection from Factor made by Mr. Jones, of Llangothlin, and although

resembling Factor in some ways is later-maturing and much more robust in growth. The average yield of the twenty-two entries was 5 tons 1 cwt. per acre.

Some of the competing crops lacked type and purity. As with all farm crops, impurity in potatoes is undesirable; it depresses market quality and frequently yield also. The most common cause of pronounced impurity is the presence of self-sown plants from previous potato crops, and these are frequently a menace as regards disease. These self-sown or "rogue" plants frequently offer some little difficulty in eradication, and in this connection growers will be wise to consider a rotation of crops; the wider use of oats, temporary pasture (such as rye grass and clover) and possibly maize on potato lands would definitely control all undesirable carry over potato plants and soil borne diseases, and would, at the same time, tend towards a maintenance of fertility.

Except in one instance where a dressing of 3 cwt. of superphosphate was given, none of the crops was manured. There seems to be some very considerable uncertainty about the value of artificial manures in potato culture in New England, but in a general way satisfactory increases of yield can be expected to follow the application of manures in standard quantities on the more highly fertile soils. From experience elsewhere it seems probable that soils of lower fertility will require improvement by green manuring or the extended use of grazing crops before a satisfactory response to artificial manuring can be anticipated.

The details of the points awarded the winners are set out in the following table:—

AWARDS (of Leading Competitors only) in the Guyra Competition.

Competitor.	Variety.	Yield per Acre.	Points Awarded.						
				Quality.		Freedom from Disease.			
			Yield.	Appearance.	Cutting.	Tops.	Tubers.	Purity.	Total.
		t. cwt.							
R. J. Fitzroy	Factor ...	10 10	52½	13½	13	7	6½	14	106½
A. F. White	,, ...	9 6	46½	13	13	6	6½	12½	97½
R. J. Fitzroy	Manhattan ...	7 11	37½	13	13	7½	6½	14	91½

Mr. Fitzroy's crops of Factor and Manhattan placed first and third respectively were on a chocolate basalt soil cropped for the first time. The Factor entry also won the championship contest and details of the cultural methods are described in connection with that contest on page 741.

Mr. A. F. White's crop of Factor was grown on a friable basalt black loam. The land was first cropped to peas in 1932 and was mouldboard ploughed in July of that year in preparation for the potato crop which was

in turn ploughed in on 12th November and was subsequently harrowed, scuffled twice and hilled. The crop had made very robust growth and returned a yield of 9 tons 6 cwt. per acre. It fell a little short of the winner as regards type and purity and carried a little more virus, but was a very meritorious effort. There was a small amount of rot amongst the tubers, probably secondary to moth injury.

Glen Innes Competition.

FIVE crops were entered for the competition conducted by the Glen Innes society, but very dry autumn weather on the western side of the district resulted in the withdrawal of three entries before final judging.

The points awarded were as follows:—

AWARDS in the Glen Innes Competition.

Competitor.	Variety.	Yield per Acre.	Points Awarded.						
			Yield.	Quality.		Freedom from Disease.		Purity.	Total.
				Appearance.	Cutting.	Tops.	Tubers.		
		t. cwt.							
E. G. Scott	Symington ...	7 17	39	13	13	7	6	13	91
E. G. Scott	Coronation ...	7 1	35	13½	13	6½	7	13	88

Mr. Scott's crop of Symington was awarded second place in the northern championship, and details of this entry are given on page 741. The friable nature of the soil, and the careful cultivation given both Mr. Scott's crops resulted in them escaping moth damage and yielding well.

PAMPHLETS AVAILABLE FOR FREE DISTRIBUTION.

FRESH impressions of the following pamphlets are now available on application to the Department, Box 36A, G.P.O., Sydney:—

Mushroom Culture.
An Improved Sweep for Filling Pit Silos.
Wheat Root Grub.
Downy Mildew of the Grape Vine.
The Woolly Aphid.
Abortion Disease in Cattle.
Suppurative Otitis in Pigs.
Necrotic Enteritis of Pigs.
Citrus Culture.

White Hide.

THE ALUM TANNING PROCESS.

The demand for information on the tanning of hides, particularly the making of white hide, has been insistent of late. For the information of our numerous inquirers we print the following directions, which have been kindly supplied to us by the Lecturer-in-Charge of the Sydney Technical College Tanning School at Waterloo.

(1) Soak the hide in clean water for four hours, then run off the dirty water and cover with clean water; leave for twenty-four hours. This should be sufficient for fresh or salted hides. Dry hides should be soaked for a further twenty-four hours, or until they are soft.

(2) Remove the hair by soaking hides in milk of lime—30 lb. lime per 100 gallons water. Handle each day, and leave until the hair can be removed—about six to seven days in summer.

(3) Remove all flesh and fat by scraping with a knife. Wash well with several lots of water during the twenty-four hours after removing the hair and pieces of flesh, fat, etc.

(4) Tan in a solution of alum (5 lb.), salt (1½ lb.), Glauber salt (1½ lb.), and water (10 gallons). Use enough of the solution to cover the hides. Handle twice daily and allow six days for tanning.

(5) Drain well from the alum and salt solution, but do not wash; then cover both sides with fish oil or neatsfoot oil, and hang up and allow to dry slowly. Tanners have a machine for forcing the oil fats, etc., into the hide.

(6) When dry, stretch until soft. If dry skins are difficult to stretch, sprinkle with water and cover for two days; again stretch and dry.

Alum-tanned leather is sometimes covered with a paste instead of oil before drying. The paste is made up as follows:—

5 lb. flour.
2½ lb. alum.
1 lb. salt.
1 lb. neatsfoot oil.
1 to 1½ gallons water.

Mix the alum and salt with water and then the flour and oil in a separate basin. Add to the flour and oil sufficient of the alum and salt solution to make a paste. Put the hide and paste into a tub, and handle the hide vigorously so as to force the paste into the leather. Hang the leather up and allow it to dry slowly without removing the paste. If the leather is too firm, rub on more fat, such as soft dripping, etc. If possible, stretch the leather just before it is quite dry. After stretching, it can be nailed on a wall or similar surface.

Prevention of Blue Mould of Tobacco.

Methods Adopted with Success at Bathurst.

R. G. MAY, H.D.A., Manager, Bathurst Experiment Farm.

Blue mould of tobacco is essentially a disease of the seed bed, and if it makes its appearance when moisture and temperature conditions are favourable to its development, may spread so rapidly that the whole bed of plants is damaged in the course of a few days.

By the adoption of cultural methods involving the control of soil moisture and temperature in the seed bed, it has been possible at Bathurst Experiment Farm to produce healthy seedlings each season for the past twelve years. Details of these methods are presented in the following article for the information of growers.

The seed beds consist of hot-air heated frames (see accompanying diagram) fitted with sliding covers made of unbleached calico painted with boiled linseed oil.

The Preparation of the Soil.

The soil should be renewed each year and should be steamed to kill insects, fungi and weed seeds before being placed in the frames, and the walls and covers of the frames should be painted with corrosive sublimate solution (1 in 1,000) before the soil is put in. This solution is deadly poison, and should be kept away from children and animals; it should be used only in a china or wooden vessel—china for preference—to keep the solution away from all metal. The heating flue pipes are covered to a depth of at least 2 inches with sand, on top of which 8 inches of good friable loam is placed.

The surface of the soil is dressed with a thin dusting of superphosphate, which should be well worked into the surface inch of soil whilst raking it in preparation for the seeding; use 4 lb. superphosphate to each 100 square feet of seed bed.

Seeding and Watering the Beds.

The tobacco seed, mixed with sufficient fine sand or ashes to ensure even sowing, is then scattered on the seed bed and firmly pressed into the soil with a flat piece of board. The seeding should be carried out in the absence of wind, otherwise the light tobacco seed may be blown away.

Special attention to the watering of the beds is essential. Cover the seed beds with fine hessian to prevent the seed being washed out of the soil. The hessian should be left on the surface until the seed coats show signs of bursting, when it should be removed. The water used in the beds should *always be tepid,* and applied evenly through a fine rose. Possibly the beds will need watering four or more times daily, using judgment to ensure that they do not dry on the surface or become too wet.

Heating the Frames.

The firing of the seed beds should commence the day before seeding, so that the soil will be warm when the seeding takes place. In the case of inexperience it is desirable to fire the beds a few days beforehand in order to obtain a proper estimate of the amount of fire necessary to maintain the requisite minimum temperature of not less than 45 degrees Fahr. night or day. A maximum and minimum thermometer is desirable, as by its use the temperature of the beds during the unattended periods of the nights, or of the day, will be recorded. This useful instrument will also record or rather indicate the necessity for increasing the amount of heat when a cool change is in progress. It is essential that the temperature of the frames does not at any time of the night or day drop below 45 degrees Fahr. Too high a temperature should likewise be avoided, it being undesirable that the temperature within the frame exceed 110 degrees Fahr., though the injurious effect of high temperatures on the plants is not very noticeable until a temperature of 125 to 130 degrees Fahr. is experienced.

Control of Ants and Insects.

Precautions should at all times be taken to prevent interference with the seeds or young plants from ants, snails, slugs, slaters, cutworms, potato moth (tobacco stem borer), and other injurious insects. Methods of control for most of these insects were recently discussed in this *Gazette,* and are available in leaflet form on application to the Department.

The use of the following bait will generally result in the disappearance of ants within five or six days should they become troublesome:—

Ant Poison Bait.

(*a*) Sugar, 4 lb.; borax, 1 oz.; water, 4 pints. Boil together for 15 minutes and then let cool.

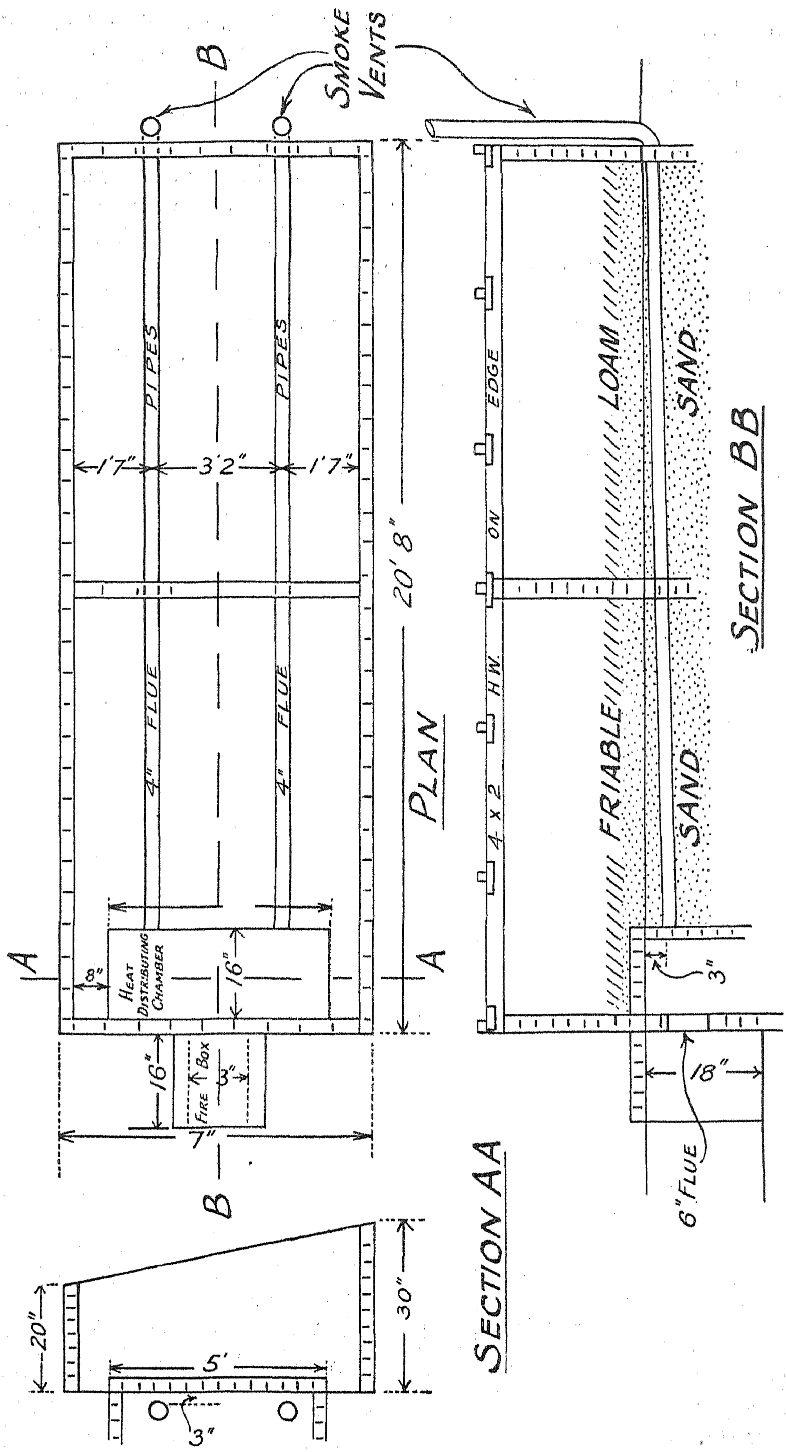
(*b*) ¼ oz. commercial arsenite of soda (weedkiller or weedicide); or else 1/6 oz. of pure arsenite of soda. Dissolve in ¼ pint of hot water; let this cool.

Mix (*a*) and (*b*) and stir in also 4 oz. of honey.

Pour 2 or 3 fluid ounces of the bait into six to ten small tins (tobacco or cigarette tins will answer; the ants crowd to feed on the bait. Small pieces of cloth placed in the tins to give plenty of foothold for the ants are suggested. Within five or six days the ants generally disappear, the bait having been conveyed to the ant nests. Make the bait strictly in accordance with the above formula, and remember there is a trace of poison in this bait, and children and domestic animals should not be allowed to reach it.

Management of the Beds.

The covers of the frame should not be removed except for watering, weeding or any other necessary reason until the time to harden off the plants arrives. At this stage the leaves of the plants will be about 1½ to 2 inches long. Open the frame covers after the chill has gone from the morning air,



Sketch of Plan and Sections of Hot-air Heated Seed Frame.

so as to leave a space on the high side of about 12 inches, closing the opening as the air cools off in the afternoon. As the plants show their ability to withstand the harder conditions, the covers can be increasingly opened for a longer time during the warmth of the day, until finally the covers can be removed entirely during the warm part of the day. The frames should be completely re-covered upon any cool change occurring, or during cold windy weather. As the plants become better rooted, the times and quantity of waterings can be reduced so as to assist in hardening off, and in the development of a better rooting system.

It is important to ensure that the judicious control of the frame covers should prevent the plantlets from becoming chilled, which predisposes towards favourable conditions for the development of blue mould or foot rot.

The control of temperature and the admission of light to the young seedlings will be materially assisted by painting the unbleached calico of the frame covers with one coat of boiled linseed oil, and on cold nights, by the addition of a cover of jute bagging (old bags opened out and stiched to form a blanket) on top of the frame covers. The bag cover should be removed as soon as the cold period of the night or cold change has passed over. The thickness of the bag covering thus to be used for maintenance of warmth in the seed beds can be gauged by the temperature recorded within the seed bed frame on such occasions. As recommended above, a maximum and minimum thermometer should be used for the purpose of temperature recording.

When the plants are about 6 inches high, they are ready for transplanting. The beds should be watered to enable the plants to be lifted easily without destroying their root system too extensively.

It cannot be too strongly emphasised that the time and labour given to the installation of heated seed beds will be lost unless constant and regular attention, as outlined above, is given to their operation.

A Few Hints on Sharpening a Steel Ploughshare.

Build a fire on the forge suitable for this particular work. This is done by banking the fire, allowing only a small opening in the side for the blaze and heat to escape. Commence with the point of the share. Insert this into the fire just far enough to heat the part you wish to draw, never permitting the heat to extend farther back on the share than is absolutely necessary. Draw this down to the proper shape and thickness, which should be as near the original bevel as possible. After the point has been finished, work back toward the heel or wing of the share, never heating more than 1½ inches from the edge and 2½ inches wide. It is important to keep hammering after the steel has changed from a red to a black heat, as this makes the edge tough and hard, giving a wearing surface that will last much longer. If once down the share is not sufficient, reheat; but confine the heated part to the foregoing measurements. In working along the cutting edge, keep it straight. In so doing you will avoid having to go back and reset the edge.

After a **solid steel share** has been set as instructed, it should be reheated to a cherry-red and left to cool in the air; **it should never be submerged in water or oil.**

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Early Clarence ...	... Butler Bros., Bombowlee, Tumut.
Fitzroy	... Manager, Experiment Farm, Grafton.
Funk's Yellow Dent	... J. A. L. Thompson. "Deep Water," South Gundagai. T. O. Quin, "Mildura," George's Plains, *via* Bathurst.
Golden Beauty ...	... W. R. Mitchell, Lower Towamba, via Eden.
Golden Glow ...	... G. Coleman, Ben Lomond.
Ulmarra Whitecap	... J. Flanders, Ulmarra.
Wellingrove ...	... Manager, New England Experiment Farm, Glen Innes.

Sorghum—

Cowper	... Principal, Hawkesbury Agricultural College, Richmond.
Oxley	... Manager, New England Experiment Farm, Glen Innes.
White African ...	... Manager, Wollongbar Experiment Farm, Lismore. Manager, Experiment Farm, Grafton.

Sudan Grass ... ... F. and H. Owen, "Applegrove," Duri.

Potato ("Certified" and "Standard" Seed)—

Carman	... Secretary, Potato Growers' Association, Bannister (Crookwell district). Secretary, Potato Growers' Association, Millthorpe.
Early Carman ...	... Secretary, Potato Growers' Association, Millthorpe.
Early Manhattan	... Secretary, Potato Growers' Association, Millthorpe. Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.
Factor	... Secretary, Potato Growers' Association, Bannister (Crookwell district). Secretary, Potato Growers' Association, Millthorpe. Secretary, Potato Section, Rural Co-operative Society Ltd., Orange (certified seed only). Secretary, Potato Growers' Association, Taralga.
Late Manhattan	... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.

Cucumber—

Early Fortune ...	... W. Parry, Terrigal.
Crystal Apple ...	... E. F. Ritter, Wyong.

Beans—

Tweed Wonder ...	... P. Morandini, "Riviera," Bunglegumbie-road, Dubbo. W. T. Sunderland, Bunglegumbie road, Dubbo. E. S. Green, Whylandra Creek, Dubbo.

Tomato—	
Improved Sunnybrook Earliana ...	... A. Sorby, Macquarie Fields.
Break-o'-Day ...	... A. Sorby, Macquarie Fields. Manager, Experiment Farm, Bathurst.
Bonny Best ...	... Manager, Experiment Farm, Bathurst. P. Morandini, "Riviera," Bunglegumbie-road, Dubbo.
Marglobe ... ... Columbia ... ... Norton	Manager, Experiment Farm, Bathurst.
Asparagus—	
Lady Washington	... Manager, Experiment Farm, Bathurst.
Melon—	
Red Seeded Citron	... Principal, Hawkesbury Agricultural College, Richmond.
Squash—	
Banana	... Principal, Hawkesbury Agricultural College, Richmond.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Wellingrove Seed Maize Contest.

The abovementioned contest will again be held this season at New England Experiment Farm, Glen Innes. This annual test affords growers of bilities of the different strains of this variety. Tests in previous years Wellingrove maize an opportunity to observe the relative yielding capa- have been very successful and have created a demand for seed of the best strains. A certificate of merit is awarded by the Department to the winner of this contest.

Growers are invited to forward samples to the manager of the New England Experiment Farm by the end of the first week in October.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Narrandera (J. D. Newth)	... Oct. 3, 4	Ariah Park (M. Collins) ...	... Oct. 11
Deniliquin (P. Fagan) ...	... " 4	Carcoar (T. G. Stammers)...	... " 11
Walbundrie (H. G. Collins)	... " 4	Griffith (M. E. Sellin) ...	... " 17, 18
Ardlethan (L. Smith) ...	... " 4	Millthorpe	... " 17, 18
Bribbaree (J. Ashton) ...	... " 4	Illabo (Geo. L. McLean) ...	... " 19
Leeton (E. C. Tweedie) ...	... " 10, 11	Cootamundra (G. B. Black)	... " 24, 25
Corowa (H. G. Norton) ...	... " 10, 11		

1934.

Inverell (E. A. Clarke) ...	... Feb. 20, 21, 22	Muswellbrook (R. C. Sawkins)	... Mar. 14, 15, 16
Newcastle (P. G. Legge) ...	... " 21 to 24	Goulburn	... " 15, 16, 17
Yass (S. C. Sleeman) ...	... " 27, 28	Gloucester	... " 20, 21
Moruya (H. P. Jeffrey) ...	... " 27, 28	Mudgee (T. P. Gallagher) ...	... " 20, 21, 22
Maitland (Montie Brown)...	... " 28, Mar. 1, 2, 3	Gunnedah (Reg. A. Brown)	... April 10, 11, 12
Moss Vale (H. Richardson)	... Mar. 1, 2, 3	Kempsey	... " 11, 12, 13
Queanbeyan	... " 2, 3	Dungog (W. H. Green) ...	... " 19, 20, 21
		Gresford (A. R. Brown) ...	... " 27, 28

Control of the Green Peach Aphid on the Murrumbidgee Irrigation Area.

P. C. HELY, B.Sc.Agr., Assistant Entomologist.

THE green peach aphid (*Myzus persicae*) infests peach and nectarine trees in all parts of the State where these fruits are commercially grown, and in some seasons is responsible for considerable damage. The principal districts affected are Orange, Goulburn, Albury, Young, Bathurst, Curlwaa, Northern Tableland, county of Cumberland, and the Murrumbidgee Irrigation Area. In this last-mentioned district, where the bulk of the State's canning peaches is produced, the annual losses caused by green peach aphids are in some seasons considerable.

Experiments on the control of this pest on the Murrumbidgee Irrigation Area were initiated by the Entomological Branch in 1928, with the object of obtaining satisfactory control either by a timely application of an aphicidal spray, or by discovering some efficient ovicide which could be applied during the winter months. The possibility of control by the first method was demonstrated in 1928, and has been confirmed in succeeding experiments, whilst tar distillates, made available for the first time in Australia as a result of the Entomologist's trip abroad, were shown by Woodhill* in 1929 to have excellent possibilities as ovicides for this pest.

Infestations of aphid eggs were practically negligible on the Area during the 1930 winter, but work was continued during the winter of 1931 and again in 1932, the principal objects being to determine the efficiency of various tar distillates at different dilutions and to arrive at the maximum dilution necessary to obtain satisfactory control of the eggs with the minimum possibility of tree injury. Tar distillates and various other materials were also tested under laboratory conditions as ovicides, and many different aphicidal sprays and dusts were tested on the hatched aphids in the field.

Seasonal Life History.

On the Irrigation Area, towards the end of April, the developing, winged, viviparous "autumn migrant females" may be found on many of the herbaceous summer host plants, and these females fly to the peach trees early in May, and almost immediately commence to deposit living young on the senile leaves. This migration continues right throughout May, and occasional migrant females may be seen on the trees until the end of June. These migrant females deposit oviparous wingless females which are pale green in colour, and may be seen in small groups of usually from five to ten on the leaf. These develop to maturity over a period of from twenty to thirty days, and apparently feed only sparingly, causing no injury to the host. When fully developed, they are fertilised by winged migrant males, and commence to deposit the overwintering eggs on the lateral growth

* WOODHILL, A. R.—The Green Peach Aphid (*Myzus persicae*): Progress Report on Spraying Experiments. *The Agricultural Gazette*, N.S.W.; 41 : 311. 1930.

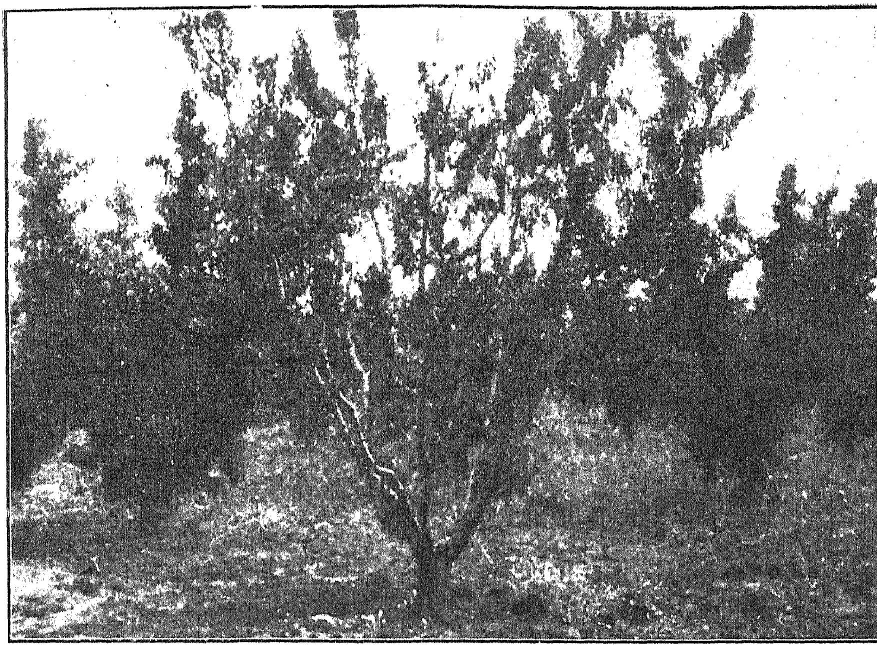
behind the buds. Should heavy rain fall during the period of growth on the leaves, as is often the case on the Murrumbidgee Irrigation Area at this period, many wingless females are washed off the leaves, whilst many others are destroyed on the leaf. As the leaves at the tops of the laterals are usually the last to fall, it is here that the majority of the eggs is usually found, though under conditions of heavy infestation the eggs may be deposited on all parts of the tree, and may even be laid on props, stakes, etc., adjacent to the trees.

At first green in colour, the eggs soon become jet-black and shining. Eggs have been noted hatching at the end of June, but nymphs from such eggs appear to remain more or less quiescent until the buds begin to swell early in August. The bulk of the hatch takes place in late July and early August, and most of the eggs have hatched before the end of the second week in August. Nymphs hatching from these eggs feed on the swelling buds, often causing a premature opening of the flowers, and the extrusion of single petals from still closely folded buds characteristically indicates their presence. Usually one generation of nymphs is produced by these "stem mothers" prior to the trees blossoming, and these invade the flowers, feeding on the reproductive organs and the interior surfaces of the corolla prior to the petals being fully unfolded. Considerable reduction in blossoming results from this invasion, and from this situation migration to the developing foliage is rapid. Several generations are developed on the foliage and on the surface of the developing fruit, much of which falls. The damage to the foliage is probably the more serious, as the trees receive a severe check from which they may not recover in one season, and also the lateral growth is badly contorted. A severe infestation of green peach aphids often damages a large quantity of fruit wood.

Early in October, the first "winged spring migrant" females are seen developing on the trees, but if cool, dry weather conditions obtain, these winged migrants may not be produced in numbers until the end of November, and this usually indicates the end of the infestation, as these aphids fly off to their summer host plants, there to carry on the life cycle until the "autumn migrants" are again developed.

The 1931 Experiments.

A block of Golden Queen peach trees, nine years old and very well grown, was selected for the 1931 series of experiments at Leeton. These trees were all lightly infested with eggs of the green peach aphid, which represented the heaviest infestation noted in the district that season. Owing to the mild, wet nature of the season, many hatched nymphs were noted at the time of applying the ovicidal sprays (21st July, 1931), but it was ascertained that many unhatched eggs were still present. The trees were not showing any sign of bud-swelling at the time when the sprays were applied. They were thoroughly sprayed with a power pump, using 2½ gallons per tree, and close attention was paid to the wetting of the tips of the laterals. The spraying was performed under bright, calm, sunny conditions, and it was



Portion of the Experiment Plot at Leeton.

In the foreground, unsprayed tree; in the background trees sprayed once (in August) with nicotine sulphate and lime-sulphur.

Showing the Advantages of Tar Distillate Spray.

The tree in the right foreground was sprayed with tar distillate (1 in 40); the tree next on the left was not sprayed.

noted that the causticity of the tar distillates on the skin of the operator was more severe than in dull or overcast weather.

The aphicidal sprays were applied under similar conditions on 10th August, 1931, when the buds were well swollen, but had not burst, and when the most forward buds were just showing pink, and when, as far as could be ascertained, all the aphids had hatched from the overwintering eggs.

The plots were so arranged as to distribute the different treatments as evenly as possible throughout the orchard, and unsprayed control trees were left in each row, one control being maintained to each six sprayed trees. The following table indicates the results of observations made on 15th October, when the infestation was at its peak:—

OBSERVATIONS made on 15th October of the Field Experiments, 1931.

Spray.	Sprayed Trees.			Controls—Not sprayed.		
	Rate.	Aphids per Tree.	Leaf Curl per Tree.	——	Aphids per Tree.	Leaf Curl per Tree.
Ovicidal Sprays applied 21st July, 1931.						
Tar distillate A	1 : 30	0·0	0·0	No. 1	5	10
,, ,, A	1 : 35	0·0	0·0	No. 2	5	10
,, ,, A	1 : 40	0·0	1·66	No. 3	3	10
,, ,, B	1 : 30	0·016	0·83	No. 4	2	10
,, ,, B	1 : 35	0·016	2·5	No. 5	2	5
,, ,, B	1 : 40	0·0	4·16	No. 6	5	10
,, ,, C	1 : 30	0·0	0·83	No. 7	5	10
,, ,, C	1 : 35	0·16	0·0	No. 8	3	10
,, ,, C	1 : 40	0·33	2·5	No. 9	3	10
,, ,, D	1 : 30	0·0	0·83	No. 10	3	10
,, ,, D	1 : 35	0·33	0·83	No. 11	5	10
,, ,, D	1 : 40	0·0	1·66	No. 12	5	10
,, ,, E	1 : 30	0·0	0·83	No. 13	5	10
,, ,, E	1 : 35	0·0	1·66	No. 14	5	10
,, ,, E	1 : 40	0·0	0·83	No. 15	5	10
Aphicidal Sprays applied 10th August, 1931.						
Red oil	1 : 40	1·93	6·6	No. 16	2	10
White oil A	1 : 40	1·0	10·0	No. 17	4	10
,, ,, B	1 : 40	0·5	10·0	No. 18	4	10
Nicotine sulphate and Soft soap	1 : 600 1 lb. : 25 gals.	0·33	10·0	No. 19	3	10
Nicotine sulphate and Lime-sulphur 26°B ...	1 : 600 1 : 8	0·0	1·66	...	...	...

N.B.—White oil "A" represents a type of white oil capable of being mixed with lime-sulphur. As the tar distillates used were proprietary compounds, each brand is given a distinguishing letter, the same lettering being used throughout both series of experiments.

It was noted early in the experiments that definite control of leaf curl caused by the fungus *Taphrina deformans* was shown in some of the plots. Estimations were also made on this at the time of making the final estimations on aphis control as a matter of interest, as this was the first record in Australia of a definite fungicidal action by tar distillates.

A system of index numbers was used in making the estimations, both for aphis and leaf curl, each tree being given a number corresponding with the degree of infestation. These numbers were totalled, and the totals were

divided by the number of trees in the plot, the figures given in the table being the averages per tree per plot. The basis for using the index numbers was different for aphids and leaf curl, and these were determined as follows:—

Aphids.—0 = no aphids, 1 = one or two small twigs infested, 2 = odd scattered twigs infested, 3 = light infestation all over the tree, 4 = Light to medium infestation, 5 = medium to heavy infestation all over the trees. It is considered that anything below 1 represents good commercial control.

Leaf Curl.—0 = clean, 5 = occasional infested leaf, and 10 = definite infestation all over tree. An average per plot of approximately three or under would represent good commercial control.

Laboratory Experiments.

In addition to the field spraying tests, some small-scale experiments were prepared under controlled conditions. Egg-bearing twigs were collected from unsprayed trees in the experiment block, and these counted out into lots of approximately 100 eggs. All broken or damaged eggs were removed, and the twigs were then sprayed by means of a small atomiser. They were then dried in the atmosphere and placed in cloth-topped jars. The percentage of mortality was computed from the proportion of hatched nymphs to unhatched eggs in both treated and control jars. These results are set out in the following table:—

TABULATED Results of Laboratory Experiments, 1931.

Jar.	Eggs.	Treatment.	Date.	Hatched Aphids.	Mortality.
			1931.		per cent.
1	102	Tar distillate A (1 : 25)	19 June	0	100
2	103	,, ,, A (1 : 30)	19 June	3	97
3	105	,, ,, A (1 : 40)	19 June	0	100
4	58	Check (unsprayed)	...	55	5
5	111	Tar distillate D (1 : 25)	3 July	0	100
6	103	Liquid soap (1 : 40)...	3 July	36	65
7	101	Red oil (1 : 20)	3 July	28	72
8	101	Tar distillate C (1 : 35)	3 July	0	100
9	101	Liquid soap (1 : 20)	3 July	41	60
10	103	Tar distillate B (1 : 25)	3 July	0	100
11	103	,, ,, C (1 : 25)	3 July	0	100
12	104	,, ,, D (1 : 35)	3 July	0	100
13	109	,, ,, B (1 : 35)	3 July	0	100
14	104	Check (unsprayed)	...	57	45

The 1932 Experiments.

During the winter of 1932 experiments were continued at Leeton with "Sim's" peaches, which showed a uniform light infestation of eggs. The trees were fairly well grown and were carrying a good deal of wood.

The ovicidal sprays were applied with a power pump under calm, overcast conditions on 21st July, 1932, and rain fell about ten hours after the spray had been applied. One set of aphicidal sprays was applied on 6th August, 1932, under less favourable conditions, when the weather was cold

and windy. The buds at this time were well swollen and all the eggs appeared to have hatched. A further series of aphicidal sprays was carried out on 8th August, 1932, in a different part of the block, under ideal conditions, the weather being calm and bright.

The Results.

Unfortunately, a very heavy infestation of peach leaf curl developed on some of the plots, and this made estimation work difficult in the plots sprayed only with an aphicidal spray. Trees sprayed with a fungicide presented a much clearer picture of the true conditions of aphis infestation, and consequently some anomalies may be noticed when making comparisons of the quantitative infestations of aphids in the different plots. These anomalies are, of course, exaggerated by the varying amount of original egg deposition on the different trees, small variations in spraying practice, and, to some slight extent, re-infestation from neighbouring trees.

A system of estimation by means of index numbers, similar to that used in the 1931 experiments, but with necessarily different standards was adopted.

THE Index Numbers Used.

Numeral.	Standard (Leaf Curl).	Standard (Aphids).
0	None	No aphids seen.
1	Very little ...	Less than three twigs per tree.
2	Light	Approximately one twig per main arm.
3	Medium ...	Approximately two twigs per main arm.
4	Heavy ...	More than two twigs per main arm.

MEAN Infestation of Plots.

Treatment.	Aphids.	Leaf Curl.
Group 1.—*Ovicides applied 21st July,* 1932—		
Tar distillate C (1 : 50)	0·0	0·46
,, ,, A (1 : 35)	0·0	0·83
,, ,, E (1 : 35)	0·0	1·66
,, ,, A (1 : 50)	0·0	1·83
,, ,, C (1 : 60)	0·5	1·0
,, ,, A (1 : 80)	0·5	2·33
Controls	1·75	3·75
Group 2.—*Aphicides applied 6th August,* 1932—		
Red oil (1 : 30)	0·2	1·83
White oil A (1 : 30)...	1·08	2·25
Pyrethrum extract (1 oz. : 16 gal.) ...	1·75	3·66
White oil B (1 : 30)...	1·91	2·50
Nicotine sulphate and soft soap	2·16	3·0
Controls	2·81	3·06
Group 3.—*Aphicides applied 8th August,* 1932—		
Nicotine sulphate and lime-sulphur ...	0·0	0·0
Pyrethrum extract and lime-sulphur ...	0·25	0·2
White oil A and lime-sulphur	0·30	0·2
Nicotine sulphate and red oil	0·5	2·42
Pyrethrum extract and red oil	1·2	2·6
,, ,, and soft soap ...	1·66	2·25
,, dust	1·83	3·0
Controls	2·08	1·91

General Conclusions and Recommendations.

In both series of experiments tar distillate washes gave excellent control of the green peach aphid when used at concentrations of 1 in 40 or higher. Even at dilutions of up to 1 in 80, these washes showed definite ovicidal value, but it is considered that for general use they should be used at 1 in 40. At this strength tar distillates are reasonably cheap, safe, and effective.

As a secondary result of these tests it was shown that tar distillates at a strength of 1 in 40 gave decided control of the fungous disease, peach leaf curl. It is important to note also that where black peach aphids are present this spray gives excellent results.

At the permissible concentrations on peach trees, tar distillates do not appear to give any satisfactory control of San José scale.

When using this spray, operators should protect the exposed parts of the skin with gloves and veils, as the material is caustic on the skin, especially in bright sunlight.

The advantages of the dormant season spraying with tar distillates lie in their excellent ovicidal value, relative cheapness, general usefulness for other pests and diseases, and in the fact that spraying may be performed over a long period compared with any aphicidal spray.

Nicotine sulphate (1 to 600) and lime-sulphur (winter strength) made the best combination tested as an aphicidal spray, which also possesses a fungicidal action. This spray may be expected to give excellent results if applied thoroughly at early pinking stage (*i.e.*, about the second week in August on the Murrumbidgee Irrigation Areas) under good warm conditions.

Nicotine sulphate combined with soap or oils is less satisfactory than the lime-sulphur-nicotine sulphate combination, and also lacks the fungicidal action.

Pyrethrum extract (1 oz. to 16 gallons) and lime-sulphur (winter strength) also proved a satisfactory combination, being superior to mixtures of pyrethrum and oil or soap. It is probable that, apart from its slight aphicidal qualities, lime-sulphur activates the nicotine sulphate or pyrethrum extract to some extent.

Practically no control of aphids was obtained where nicotine (and to a lesser extent pyrethrum) was applied under cold, breezy conditions, and this probably explains the failures which sometimes accompany the use of nicotine sulphate.

Red and white oil sprays give some control when used as aphicides at 1 in 30, but under conditions of heavy infestation these cannot be regarded as sufficiently satisfactory. Unless a specially prepared white oil capable of being mixed with lime-sulphur is used, the fungicide must be applied as a separate application.

Pyrethrum dust gave poor control of aphids and none of leaf curl. Dusting is not a practicable method of control of green peach aphids with the generally available apparatus, and conditions which usually obtain on the Irrigation Areas during August are inimical to the satisfactory application of the dust.

In no instance throughout the experiments did any appreciable re-infestation of sprayed trees take place. Control trees in all instances showed definite infestation of both green peach aphids and peach leaf curl.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1932 budding season, trees from which should be available for planting during the 1933 planting season :—

Nurseryman.	Oranges.		Eureka. Lemon.	Marsh. Grape-fruit.	Total.
	Washington Navel.	Valencia.			
L. P. Rosen and Son, Carlingford...	4,000	4,000	1,000	1,000	10,000
T. Adamson, Ermington	1,500	1,500	500	250	3,750
A. T. Eyles, Rydalmere	2,000	1,000	...	...	3,000
H. J. Ferguson, Wyong	...	200	...	...	200

—C. G. SAVAGE, Director of Fruit Culture.

Disappointing results in the control of black spot of the apple have invariably been traced to a confusion in the minds of growers as to what constitutes "spur-burst," "pink," and "calyx" stages of blossom formation—the correct stages at which to spray. To assist in this direction the Department is publishing a leaflet containing coloured illustrations of the different stages mentioned, and these will be distributed free on application.

Orchard Notes.

OCTOBER.

C. G. SAVAGE and W. LE GAY BRERETON.

Time to Plant Pineapples.

FROM now until the end of December is the most suitable time to plant pineapples. The land should be as free as possible from weeds (especially paspalum, couch, Johnson grass, etc.), and should be brought to a good tilth before planting is commenced.

Suckers are Mostly Used.

The most popular type of plant used to commence the plantation is a "sucker" which shoots from the base of the parent plant, the sucker coming into bearing quicker than any other type of plant used. The "nib" or "robber" is preferred by many growers because it produces a better first fruit than the sucker, although it takes some months longer to come into bearing. The nib or robber develops from buds at the base of the fruit. "Crowns," or "tops," which grow on the head of the fruit, can be used, but at least two years elapse before fruit is produced on plants raised by this means.

Showing the Different Parts of the Plant Used for Propagation.
1. Sucker. 2. Nib. 3. Crown.

Methods of Planting.

There are two popular methods of planting, single rows and double rows. In the single-row method the plants are placed 18 to 24 inches apart with 7 to 9 feet between the rows. With the double-row method the plants are placed 18 to 20 inches apart with the two rows 20 to 22 inches apart. The plants in the two rows are not placed opposite each other, but staggered, *i.e.*, with those in one row midway between those in the other. The distance between double-row and double-row is 7 to 9 feet.

The young plants may be set 2 to 3 inches deep, according to size, and may be dropped along the rows by one man, while another follows and plants, first making a hole with a small hand shovel or a dibble. After planting, the soil should be pressed firmly around the young plants with the foot. Care should be taken when planting to prevent the soil entering the crown or heart leaves of the plant, as this will prevent progress and growth of the plant.

If planting on a hillside, plant the rows across the hill, thus avoiding excessive washing of soil from between the rows which would occur during heavy rains if the rows ran up and down the hillside.

During the early years of the plantation the wide space between the rows can be used for growing tomatoes, beans, etc.

Further details concerning pineapple growing are available in leaflet form from the Department, Box 36A, G.P.O., Sydney.

Thinning of Fruits.

Writing of conditions on the Murrumbidgee Irrigation Area, Mr. G. W. Beverley, Senior Fruit Instructor, advises that prospects are promising for another fair crop of apricots this season. With the growing demand for good-quality fruit, continues Mr. Beverley, it will be necessary, if best returns are aimed at, to thin out the fruit. This should be done before the stoning stage. At the time of the forming of the stone in the fruit there is often a natural shedding, and many growers are content to leave the process to nature, fearing that if they thin out the fruit heavy winds may deplete the crop to too large an extent. Where the fruit sets very closely on short spurs, it is very advisable to thin out to enable the fruit to swell to the size desired.

Discussing generally, the question of thinning fruits, the Director of Fruit Culture (Mr. C. G. Savage), in his report on recent investigations in Canada and U.S.A., says that in the light of recent investigations, there appears to be need for modification in the present methods adopted in the thinning of fruit crops. It is customary to thin a fruit crop by removing fruits, in order to space them at more or less even distances. Investigations show that each fruit requires a definite minimum of leaves to allow it to size up and mature satisfactorily. There is very little transverse movement of elaborated sap in the plant, the flow being mainly in a downward direction, and it has been demonstrated that fruit will be nourished from leaves at least 6 to 10 feet away. This being so, provided sufficient leaves are present, fruit on the ends of the limbs could be removed, while those towards the base might be retained during thinning operations. This method would reduce loss and damage by wind.

The number of leaves required for the satisfactory maturing and sizing of apples is in the neighbourhood of forty normal leaves, but investigations would have to be made to determine the number of leaves necessary to mature the fruit of the various varieties satisfactorily.

Some copies of Mr. Savage's report are still available to those interested.

Germany's Banana Flour Industry.

THE German banana flour industry is concentrated in Hamburg, and one firm practically controls the trade. It is claimed that this concern has a special electrical and air-cooling method of manufacture which retains the vitamins of the raw frit and produces a finer and whiter flour than the competing milling methods, states an American official report from Hamburg.

Continuing, the report states that the plantain is used as the raw material for the production of the flour. The fruit is dried and exported in the form of chips, known in Germany as "plantain schnitzel." The sources of supply shipping the best material are stated to be West Africa, Honduras and Jamaica. Equador has commenced shipping both the dried chips and the fresh fruit and is endeavouring to build up a worthwhile trade in this article.

Banana Plants Require Shelter.
Note the damage done by wind to the leaves of this stool.

The local product is sold under the trade name of "Bokkoko," and is sold not only in Germany but also in Central Europe, the Baltic countries, and in France when the French colonial crop is poor. The estimated German production of banana flour during 1932 was approximately 1,500 metric tons.

The chief sources of supply for banana chips are West Africa, Honduras, Jamaica, Brazil and New Guinea. Imports of these chips for preparing banana flour are not listed separately in the German import statistics. The following estimates, however, in metric tons are believed to be reliable:—1929, 5,000 tons; 1930, 4,000 tons; 1931, 3,200 tons; 1932, 1,900 tons.

There are no imports of banana flour into Germany, owing to the high duty and to adequate home manufacture.

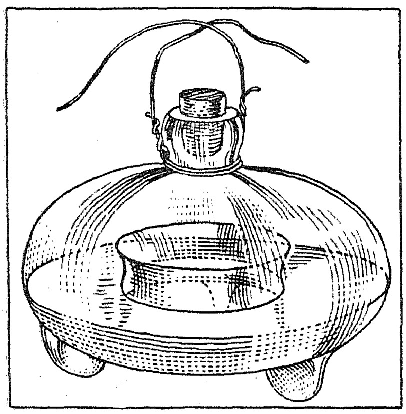
Banana flour is utilised in Germany for mixing with cocoa, etc., to prepare invalid foodstuffs and various patent feeding mixtures for adults and

children. The pharmaceutical manufacturing trade likewise purchases moderate amounts for similar special purposes.

Apart from relieving the fresh fruit trade at any time a glut threatens, the manufacture of banana flour and dried bananas would appear to offer a means of turning to profit undersized and otherwise unsaleable, yet wholesome, fruit. The Department (N.S.W.) is alive to these possibilities, and experiments in the production of banana flour are at present being carried out at Hawkesbury Agricultural College, Richmond. Already some success has been attained in the drying of bananas at this same institution.

Fruit Flies Likely to be Serious This Summer.

THE Department's Entomologist, Mr. W. B. Gurney, reports that unless the recommended control measures are carried out, the fruit-fly will become a serious menace this summer. The fly caused serious losses last season, and as adult flies have been observed throughout the past winter, it is essential that control measures be undertaken as early as possible to destroy these over-wintering flies and thus prevent heavier infestations later in the season.



Glass Fruit Fly Trap.

The Act requires all persons with fruit trees (in back yards as well as in orchards) either to set out fruit-fly traps or to spray patches of the foliage of their fruit trees with a foliage poison spray once a week for five weeks prior to harvesting or ripening of the fruit. The glass fruit-fly traps should be baited with six fluid ounces of one of the following mixtures:—

(*a*) One-eighth fluid ounce (a teaspoonful) of vanilla, half a fluid ounce (a tablesponful) of household ammonia with six and a half pints of water (but preferably with only one and a half pints of water).

(*b*) Boil five pounds apples, pears or peaches in one gallon water to make the syrup.

Where spraying is undertaken in preference to trapping, the foliage poison spray should be made as follows:—

Boil five pounds of fruit in one gallon of water, strain the syrup off and add to it three gallons water in which five ounces of lead arsenate powder is mixed and four pounds molasses dissolved.

A penalty of up to £50 may be imposed for non-compliance with the Act.

Picking and Pruning Made Less Laborious.

BY PLANK ATTACHMENT TO LORRY.

J. D. BRYDEN, Fruit Inspector.

In this article Mr. Bryden describes how Mr. W. H. Miller, of Corbie Hill, Leeton, fitted a movable plank to his orchard lorry for the purpose of facilitating the operations of pruning and picking. It should certainly prove an erergy- and labour-saving device, since it does away with the use of orchard ladders, etc. Moreover, two or three men can work from the lorry and plank at the same time.

As the plank is only a temporary fixture, it can be removed whenever the lorry is required for other work.

THE plank, which is attached at a point about 2 feet from the back and 18 inches from the side of the lorry by means of a single bolt through the deck and a runner, can be easily swung, by means of a rope, into any required position alongside the tree. For picking or pruning the lorry is driven from tree to tree along the row and at each tree the plank is shifted into position (see illustration), allowing access to half of the tree, and being swung out behind the lorry when moving to the next. The work on

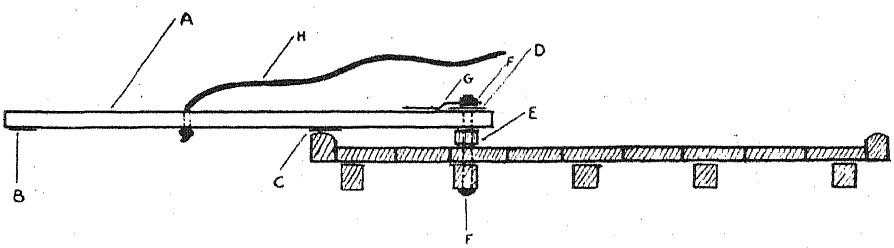


Fig. 1.—Section of Lorry Deck and Runners with Plank Attached.

each tree is completed by driving the lorry along the other side of the row, in the opposite direction, and repeating the operation, thus giving access to the other half of the tree.

The lorry and plank provide ample space for moving about to the different parts of the tree within reach, and are considerably less tiring on the user than a ladder, while they obviate the necessity of driving completely around the tree, as is necessary when a lorry or spring cart alone is used. When an unusually high limb has to be reached a box can readily be placed in the desired position on the deck or on the plank. During

harvesting three men can work quite comfortably on the lorry and plank, and still leave a considerable amount of space on the side of the lorry away from the tree where cases can be stacked.

Materials Required.

The following materials are required and, with the probable exception of the timber for the plank, can usually be found on the farm:—

1 oregon plank, 7 feet long by 12 inches by 2 inches thick.
2 iron plates each 12 inches by 3 inches by ⅛ inch thick.
1 iron plate about 4 inches by 4 inches by ⅛ inch thick.
1 piece hardwood 12 inches long by 2 inches by 3 inches.
1 long bolt.
1 piece strong ½-inch rope 4 feet long.

The suggested measurements can, of course, be varied.

The plank (A in Fig. 1) should be of oregon or some strong light timber so that it can be easily moved; hardwood is too heavy for convenient handling.

One of the larger iron plates is screwed to the underside at the end of the plank away from the lorry to prevent warping (B in Fig. 1), and the other is screwed to the underside where it comes in contact with the side of the lorry when the plank is swung out to the tree (C in Fig. 1). If this is not done the iron capping along the side pieces of the lorry decking will gradually wear away the plank. The smaller iron plate has a hole drilled to take the bolt and is used as a washer on the nut, but should be secured by screws to the plank (D in Fig. 1).

It is necessary to build up the decking at the point where the plank is to be bolted through the runner, so as to obtain the same height as the edge and allow the plank to lie level. This is done by nailing a piece of 2 by 3 inch hardwood about 12 inches long in position on the deck immediately above the runner (E in Fig. 1). After boring the hole through the plank and through the block, deck, and runner, the bolt is inserted from the under side of the runner and the plank secured by the nut (F in Fig. 1). A small piece of tin with a section cut out so as to closely fit the nut is tacked on to the plank to act as a nutlock (G in Fig. 1). Some such precaution is necessary so as to eliminate entirely the possibility of the nut unscrewing as a result of the continued movement due to the plank being shifted to suit the convenience of the operator. The piece of tin can be bent upwards out of position when it is desired to unscrew the nut.

A hole is bored through the middle of the plank at a point about two-thirds of its length from the bolt and the rope placed through and knotted on the underside (H in Fig. 1).

Care has to be taken to see that the plank is moved out of position before proceeding from one tree to the next, so as to avoid injury to the limbs. This operation, however, becomes more or less a habit after the device has been used for a short time.

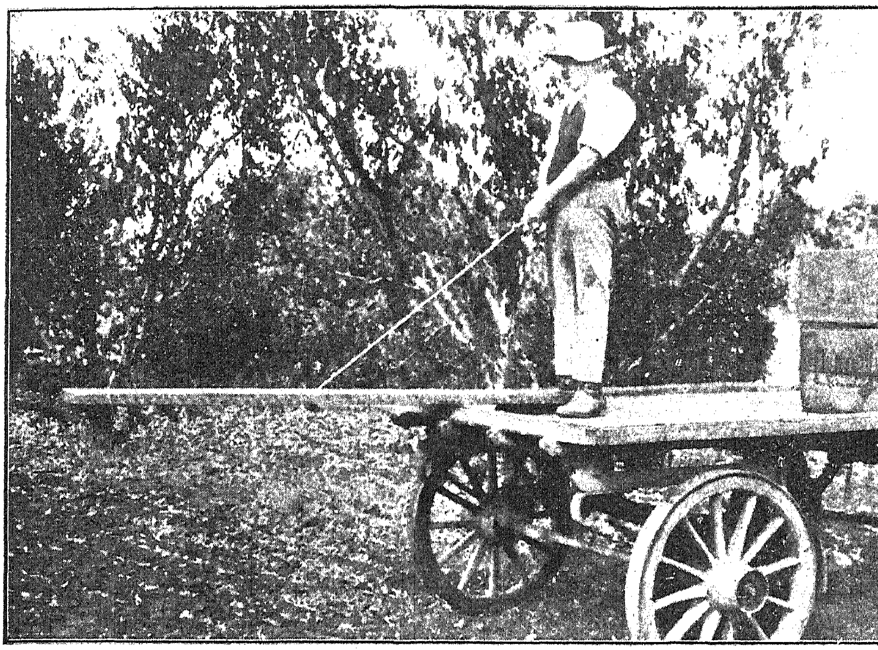


Fig. 2.—Plank Being Swung Out Behind the Lorry.

Fig. 3.—In This Position the Plank and Lorry Give Access to Half the Tree.

If necessary, in order to reach the higher limbs, a box can be placed on the plank.

[*Photos. by W. Poggendorff.*

Jetting Mixtures for the Control of Sheep Blowfly Attack.

EXPERIMENTS CARRIED OUT DURING 1932–33.

R. N. McCULLOCH, B.Sc., B.Sc.Agr., Assistant Entomologist.

Experiments aiming at the improvement of jetting mixtures for the control of sheep blowfly attack carried out during 1931-32 were recorded in the *Agricultural Gazette* for August, 1932, the use of two new mixtures (having as their bases calcium arsenate and Paris green respectively, and which showed considerable promise) being described.

The following report concerns a series of experiments conducted in 1932-33, having as its objects—

1. Repeating comparisons between new mixtures and preparations already in general use.
2. Estimating, if possible, the real value in sheep blowfly control of jetting with the most promising mixtures.
3. Investigating the value of mixtures not hitherto tried in the field.

To those sheepowners who believe jetting with well-known mixtures to be a payable proposition, any improvement in mixtures is of immediate interest. But there are many owners, particularly in New South Wales, who believe that jetting, as they understand it, does not pay, or is of doubtful value. Accordingly, it was proposed during the past season to find if possible, by experiment, the real value of jetting (that is, the time during which one application of a mixture will obviate the necessity of handling, for fly, a jetted flock), using the best mixture as yet tried, namely, calcium arsenite suspension in water.

Details of the Experiments.

Experiments were therefore planned in 1932-33, in which, for the duration of the autumn fly period, comparisons were to be made between the number of sheep requiring dressing in groups treated as follows:—

(*a*) Crutched and not subsequently jetted;

(*b*) Crutched and subsequently jetted periodically as was considered necessary;

(*c*) Not crutched; jetted periodically as seemed necessary.

However, little evidence was obtained, because of paucity of strike.

In other experiments an attempt was made to record the severity and nature of individual strikes in jetted and untreated groups at each examination—so that an estimate might be made of the time during which a jetted flock would be sufficiently protected not to need handling and dressing.

Several mixtures not hitherto tested in the field were tried in 1932-33, and these included an especially fine Paris green prepared abroad for use

against mosquito larvae (subsequently referred to as Paris green A), and also a modification of the calcium arsenite mixture. The calcium arsenite fluid used in 1931-32 (called No. 1 mixture) took the form of a suspension of unsoluble particles. The modified mixture (called No. 2) had some of its arsenic (approximately 25 per cent.) in the form of the soluble arsenite of soda; it was found difficult to prepare in the field since small mistakes in weighing or mixing would lead to dangerous quantities of caustic soda in solution.

The 1932-33 experiments were conducted with the co-operation of the Manager and Sheep and Wool Instructor at Trangie Experiment Farm, and of Mr. Henry White, of "Talbragar," Coolah, Mr. W. A. Hunter, of "Eureka," Gulargambone, Mr. J. S. Kenny, of "Brooklyn," Mendooran, and Messrs. Vaughan and Pinner, of "Myall View," Gilgandra, who placed some of their sheep and considerable labour at the disposal of the writer for the carrying out of tests.

Dry weather very considerably interfered with the programme mapped out, and at Mendooran and Gilgandra prevented the tests being proceeded with.

Throughout the tests, all sheep found blown were dressed with the station dressing in use, and allowed to continue to run with the jetted sheep. Re-strikes on such dressed sheep were uniformly rare, and were treated as having no influence on the final figures obtained.

The Trials at Coolah.

Sheep were jetted at "Talbragar," the property of Mr. Henry White, on 26th-28th October and 19th-20th November, 1932, and on 19th May, 1933. No results were obtained from the latter treatment, as all the sheep, including those untreated, subsequently escaped strike.

In October the sheep handled were in three flocks of ewes, viz.—weaners (948), hoggets (473), and cull ewes of mixed ages (1,591). Each flock was divided into groups, after classing and sorting for susceptibility to strike, so that the groups were representative of the flocks.

The mixtures used were:—

(*a*) Arsenite of soda solution (8 lb. white arsenic, 12 lb. of washing soda, water 100 gallons).

(*b*) Calcium arsenite mixture No. 2 (8 lb. white arsenic, 5 lb stone lime, 3 lb. caustic soda, water 100 gallons).

(*c*) Paris green suspension (10 lb. Paris green, 4 lb. soft soap, water 100 gallons).

The jetting was done in a single-sheep raised race, and four to five were done with each gallon of mixture. Subsequently, the flocks were examined each week by Mr. White, and the blown sheep in each lot were counted as they were dressed.

The protection afforded by the jettings was poor; this was especially true of arsenite of soda.

The writer again visited "Talbragar" and re-jetted on 18th and 19th November, 1932, three weeks after the first treatment. On this occasion the hoggets were not jetted. The weaners were treated as follows:—

(*a*) The sheep in the group originally jetted with arsenic and soda solution were again done with the same mixture at increased strength, namely 10 lb. white arsenic and 13 lb. washing soda per 100 gallons.

(*b*) The calcium arsenite group sheep were re-jetted with calcium arsenite No. 1 mixture (10 lb. white arsenic, 10 lb. stone lime, 1 lb. caustic soda per 100 gallons), as used at Gulargambone during the autumn of 1932.

(*c*) Half of the original control sheep were jetted with a proprietary sheep dip at the rate of one 10-lb. packet per 25 gallons.

(*d*) The other half of the original control sheep were left untreated, except that blown sheep were jetted with dip as a treatment for strike.

In the cull ewes the groups originally jetted with Paris green and calcium arsenite (No. 2 mixture) were left untreated. The original controls (760 sheep) were divided into three flocks, after appropriate classing for susceptibility. Of these, the first was jetted with calcium arsenite (No. 1 mixture); the second was jetted with Paris green A at the rate of 10 lb. per 100 gallons with 4 lb. soap added. The third was left untreated, except that the eighteen struck sheep included were jetted as treatment with Paris green A mixture.

As before, Mr. White kept records of the strikes dressed. Throughout the experiments, when sheep were dressed, the primary green blowfly (*Lucilia cuprina*) was seen to be active.

The sheep found struck at the various examinations from the time of the first jetting until mid-December—six to seven weeks later—are recorded in the tables below:—

HOGGETS (Flock I) Found Struck at Various Examinations.

Time of examination.	Treatment. Untreated (157 sheep).		Jetted with arsenite of soda 8–12–100 (158 sheep).		Jetted with calcium arsenite 8–5–3–100 (158 sheep).	
	No.	Per cent.	No.	Per cent.	No.	Per cent
First week after jetting ...	9	5·7	5	3·1	3	1·8
Second week after jetting ...	14	8·9	10	6·3	7	4·4
Third week after jetting ...	7	4·4	12	7·6	11	7·0
Total for three weeks ...	30	19·0	27	17·0	21	13·2
Fourth week after jetting ...	3	...	3	...	4	...
Fifth week after jetting ...	3	...	3	...	3	...

Weaners (Flock II) Found Struck at Various Examinations.

Date of Examination.	Treatment. Arsenite of soda, 8–12–100 (316 sheep).		Calcium arsenite, 8–5–3–100 (316 sheep).		Untreated. (316 sheep).	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
First week after jetting ...	10	3·2	6	1·9	16	5·1
Second week after jetting ...	49	16·0	44	14·0	50	16·0
Third week after jetting ...	36	10·7	24	7·6	64	20·2
Total for three weeks ...	95	29·9	74	23·5	130	41·3

19–11–32.	Re-treated with arsenite of soda, 10–13–100 (305 sheep).		Re-treated calcium arsenite, 10–10–1–100 (312 sheep).		330 sheep divided to two groups. Treated with sheep-dip, 1–25 (165 sheep).		Control. Blown and treated with sheep-dip (32 sheep).		Control. Not blown, untreated (133 sheep).	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
24–11–32	20	6·5	15	4·8	9	5·4	6	18·7	7	5·2
2–12–32	16	5·25	8	2·5	9	5·4	3	9·2	12	9·0
13–12–32	17	5·6	8	2·5	5	3·0	...	...	5	3·8
Total for four weeks ...	53	17·4	31	9·8	...	13·8	9	28	24	18
								Control average, 20 Per cent.		

Cull Ewes (Flock III) Found Struck at Various Examinations.

Date of Examination.	Treatment. Calcium arsenite, 8–5–3–100 (531 sheep).		Paris green and soap, 10–4–100 (300 sheep).		Untreated. (760 sheep).	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
First week after jetting... ...	12	2·4	4	1·3	20	2·6
Second week after jetting... ...	16	3·0	5	1·6	33	4·4
Third week after jetting... ...	16	3·0	7	2·3	67	8·8
Total for three weeks ...	44	8·4	16	5·2	120	15·8

19–11–32.	No further treatment.		No further treatment.		774 sheep divided into three groups. Calcium arsenite, 10–10–1–100 (258 sheep).		Paris green A and soap, 10–4–100 (258 sheep).		Control. Blown and treated with Paris green A (18 sheep).	Control. Not blown, untreated (240 sheep).	
					No.	Per cent.	No.	Per cent.	No.	No.	Per cent.
24–11–32 ...	1	...	0	...	1	0·4	2	0·8	0	1	0·4
7–12–32 ...	33	6·2	17	5·6	6	2·3	5	2·0	0	14	5·8
17–12–32 ...	6	...	7	...	2	0·8	1	0·4	0	3	1·3
Total for 28 days ...	...	...	...	...	9	3·5	8	3·2	0	18	7·5

These figures show a very poor protection by all mixtures for even a short period of three weeks. It will be noticed that calcium arsenite mixtures gave considerably better results than did arsenite of soda, but the strikes in all treated groups are so high as to cast grave doubts on the value of jetting were it not that Mr. White reported that in all treated groups the strikes were small, whereas at each examination a number of unjetted sheep were badly struck. The writer examined the weaners and cull ewes found blown on 19th November, and on many of the jetted sheep, maggots could only be found with difficulty.

The sheep were generally of a very susceptible type. They were very wrinkled, dense-woolled and carried much condition in the wool. It may be that the prevention, by jetting, of small strikes on susceptible sheep is more difficult than on the more plain-bodied animals. All arsenical mixtures gave better protection during 1932-33 at Trangie and Gulargambone, where they were tested on flocks of plain-bodied sheep, than they did on the more generally susceptible animals at "Talbragar."

Trangie Experiment Farm.

On 8th February last 600 flock ewe hoggets at Trangie Experiment Farm were divided into three groups of 200, the groups including equal numbers of sheep considered markedly, moderately, and non-susceptible to fly strike. It was arranged that two of these groups should be crutched at the normal time (16th February), and that the third group should be jetted with calcium arsenite (No. 1 mixture), as soon as fly attack became obvious in them. The crutching was duly done.

The strikes dressed throughout the experiment are given in the table below:—

STRIKES Dressed at Trangie Experiment Farm.

Date of examination.	Crutched 16th February (200 sheep).	Crutched 16th February (200 sheep).	Jetted 7th March (200 sheep).
1933.			
28 March ...	0	0	2 slight strikes.
19 April ...	0	0	1 very bad strike.*
9 May ...	4 ordinary, 1 heavy } 5 strikes	1 slight, 4 ordinary, 3 heavy } 8 strikes	8 slight, 32 ordinary, 2 heavy } 42 strikes.
	No further treatment...	Jetted 12th May (189 sheep).	Jetted 12th May (195 sheep).
27 May ...	1 slight, 4 ordinary } 5 strikes	1 slight	1 slight, 1 ordinary } 2 strikes.
14 June ...	1 slight	0	1 slight.
26 June ...	0	0	1 slight.

* The one sheep dressed on 19th April showed very bad jetting injury, and the maggots were working under extensive scabs. Jetting injury is discussed later in this article.

The uncrutched group showed some fly strike at the end of February, and on 7th March they were jetted with calcium arsenite, 10-10-1-100. Very little blowfly trouble occurred during the following two months. On 28th March and 19th April respectively two very slightly and one very badly blown sheep in the jetted group were dressed. Then on 9th May many sheep were dressed, especially in the jetted group. Accordingly on 12th May that group and one of the crutched groups were jetted. Subsequently very few strikes were noted in any of the lots.

The heavy incidence of strike noted on 9th May, nine weeks after jetting, shows clearly that that treatment no longer had any protective value. The absence of appreciable fly trouble after the jetting on 12th May robbed the experiment of most of its value.

The Experiments at Eureka Station, Gulargambone.

On 19th April experiments with jetting were commenced in flocks of 937 twelve-months-old and 841 eighteen-months-old ewes. The sheep had not been crutched and were carrying approximately nine months' wool.

In the first flock the mixtures used were: (1) arsenite of soda solution (8 lb. white arsenic, 2 lb. caustic soda and 100 gallons water); (2) calcium arsenite No. 1 mixture (8.8 lb. white arsenic, 8.8 lb. stone lime, 15 oz. caustic soda per 100 gallons water), and (3) Paris green A suspension (10 lb. Paris green A, 4 lb. soap per 100 gallons water). In the second flock the mixtures used were the same as in the first, except that ordinary commercial Paris green replaced Paris green A.

Throughout the autumn rainfall was below average, grass was scarce, and the blowfly for a time was unusually inactive. No sheep were dressed for nearly a month after jetting, but from then on considerable trouble was experienced for three to four weeks, when wintry conditions occurred which were followed by a cessation of blowfly activity. While sheep were being dressed the primary green blowfly (*Lucilia cuprina*) was seen to be active.

The strikes in the various groups at the different examinations are set out in the following table:—

STRIKES in Flock I at Various Examinations.

Date of examination.	Control, untreated (250 sheep).		Jetted with arsenic and soda (250 sheep).		Jetted with Paris green A (184 sheep).		Jetted with calcium arsenite (253 sheep).	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
1933.								
16 May...	29	11·6	7	2·8	11	6·0	2	0·8
25 May...	32	12·8	20	8·0	13	7·0	12	4·7
7 June	24	9·6	12	4·8	32	17·9	14	5·6
Total until seven weeks after jetting	85	34·0	39	15·6	56	30·9	28	11·1

STRIKES in Flock II at Various Examinations.

Date of examination.	Control, untreated (233 sheep).		Jetted with arsenic and soda (204 sheep).		Jetted with commercial Paris green (204 sheep).		Jetted with calcium arsenite (204 sheep).	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
1933.								
16 May...	3	} 9·9	1	} 7	6	3·0	6	3·0
27 May...	20		13					
9 June	35	15	36	18	21	10·5	14	7·0
Total until seven weeks after jetting.	58	24·9	50	25	27	13·5	20	10

No explanation can be given of the failure of Paris green A to give such efficient control as other mixtures. The material has not been tested for its stomach poison toxicity (and this will be done), but its chemical composition is similar to that of ordinary commercial Paris green. Samples of the finest and the coarsest particles from ordinary Paris green proved, when tested, of equal toxicity to the larvæ of *Lucilia sericata.*

In the experiments at "Eureka" a note was made of the nature of the individual strikes. Mr. Hunter reported on 16th May that "All the strikes were light except for those on some of the untreated sheep." When the flocks were examined on 25th and 27th May the writer assisted and kept the records. Strikes were described as "touched," "moderate" and "bad."

"Touched" described a strike on which the skin was broken over an area not more than 1½ inches across.

"Moderate strike" was used where the area of broken skin was not more than 2½ inches across.

"Bad strike" was used for any larger area—in jetted sheep any area extending beyond the approximate ring of jetting fluid.

The differentiation of the strikes at that examination for the two flocks together are recorded in the table below:—

	Touched.	Moderate.	Bad.
Control	13	22	17*
Arsenic and soda	10	18	5
Paris green	9	9	1
Calcium arsenite	11	6	1

* Including six "very bad."

Mr. Hunter's report of the examination of flock I on 7th June was that all strikes were light to moderate except three in the control lot, which were very bad. No record of differentiation was kept for flock II on 9th June.

From this it would seem that the sheep jetted on 19th April with calcium arsenite and Paris green, if not subsequently attended to, would have escaped serious injury until 27th May—five and a half weeks later.

The Effect of Jetting on the Sheep and Wool.

On 12th May, Mr. Levy, Sheep and Wool Instructor at Trangie Experiment Farm, reported that the ewe hoggets jetted on 7th March showed considerable injury. Owing to the almost complete absence of fly activity, the condition was not considered important until 9th May, when fly strike suddenly appeared and forty-two of the 200 jetted sheep were dressed. At that time the injury took the form of large, hard scabs up to 2 inches in breadth, lying in the wool away from the skin, with, in some few cases, pus still exuding from healing sores underneath. Generally, injured sheep showed one or two circular scabs in the wool beside the crutch. On 19th April a sheep had been found badly struck under scabs which extended nearly completely round the crutch. This animal died.

After examining the injured sheep at Trangie, the writer looked for a similar condition in other experiment flocks. Observations made on all flocks are set out below:—

Location of Flock.	Condition of fleece at time of jetting.	Pressure used per square inch.	Condition of sheep one to two months after jetting.
Trangie Experiment Farm—jetted 7th March.	3½ months' wool (sheep crutched in November).	170–225 lb.	Severe injury.
Gulargambone — jetted 19th April.	9 months' wool ...	100–300 ,,	Moderate injury.
Trangie Experiment Farm—jetted 12th May.	5½ months' wool; 3 months' wool.	100–125 ,,	No injury.
Coolah—jetted 19th May ...	3 months' wool ...	100–125 ,,	,,

It will be seen that the second jetting at Trangie and also that at Coolah, when low pressure was used, were not followed by injury. At Gulargambone the scabbing condition (which was found there, incidentally, in all the experiment groups) followed the use of pressures which fluctuated greatly from 100 lb. to 300 lb. per square inch. At Trangie, when the damage was done, the pressure used varied from 160 lb. to 225 lb. per square inch. With a hand pump the needle of the gauge was kept swaying about 180 lb. while the jet was open. This mean that when the jet was shut off the pressure instantly rose to about 225 lb. per square inch, at which pressure the next sheep received its first hit of the jet.

Without having carried out experiments to confirm this view, the writer is of the opinion that injury, such as occurred at Trangie, could be caused by a solid jet of liquid striking the skin at high pressure. The pressure required to cause the condition would depend on the type of jet produced by the nozzle in use and on the length and nature of the fleece. It is thought that a defective nozzle which tends to throw a spreading jet necessitates the use of increased pressures, and at those high pressures is less dangerous to the sheep than a perfect nozzle, but that with a good nozzle pressures in excess of 150 lb. per square inch are unnecessary.

Jetting with calcium arsenite mixtures has some effect on the wool, rendering it somewhat harsh and rather difficult to cut with hand shears. The condition disappears and the wool appears normal again within six to eight weeks after jetting. Samples taken at Trangie on 6th July from sheep jetted on 12th May washed readily in soap solution when tested by the writer.

Summary and Conclusions.

As in 1932, calcium arsenite No. 1 mixture gave considerably better protection from blowfly strike than did arsenite of soda solution or the sheep-dip used. It is the best mixture as yet tried by the writer in the field.

Paris green suspension in soap solution has not as yet given quite such good control. At Gulargambone it proved slightly inferior to calcium arsenite No. 1 mixture; at Coolah it gave better protection than calcium arsenite No. 2 mixture.

Paris green A at Gulargambone gave surprisingly poor protection. At Coolah, in a test in which very light infestation was experienced, it appeared to give very slightly better protection than did calcium arsenite No. 1 mixture.

A modification of the calcium arsenite fluid, called No. 2 mixture, having approximately 25 per cent. of its arsenic in a soluble form, did not prove satisfactory. The protection afforded by it did not promise to be any greater, and its preparation is more difficult than that of No. 1 mixture.

It would seem that jetting with arsenicals depends for its value as much on the limiting of the spread of strikes as on their prevention.

The immunity from serious strike which followed jetting with calcium arsenite No. 1 mixture at Gulargambone was estimated at approximately six weeks, and at Coolah the writer considered it to be at least four weeks.

More information is required before the maximum time during which jetting with calcium arsenite, No. 1 mixture, will obviate the necessity for hand-dressing or re-jetting, can be stated, but this period of practical immunity is longer than when arsenite of soda is used.

In the opinion of the writer, jetting injury, such as that seen at Trangie and Gulargambone, may be attributed to the use of excessive pressures. Evidence points to pressures exceeding 150 lb. per square inch as being dangerous.

We have received many complimentary remarks concerning the comprehensiveness of the recently-issued book, "The Sheep Blowfly Problem in Australia." This publication, which was issued jointly by the New South Wales Department of Agriculture and the Council for Scientific and Industrial Research, is obtainable from the first-mentioned institution, Box 36A, G.P.O., Sydney, price 1s. 6d. per copy, post free.

The Feeding of Dairy Cows.

S. R. BALLARD, H.D.D., Senior Dairy Instructor.

The practice of hand feeding their stock has become more general with dairy farmers during recent years, and the results which have been obtained in many instances where the feeding of balanced rations to milking cows is resorted to, in even some small way, serve to indicate the great value of a knowledge of feeding methods. During the last twelve months many new production records have been established by cows officially recorded, both privately and government owned, and it is interesting to note that in all the cases of outstanding production strict attention has been given to the matter of providing properly balanced foodstuffs to meet the requirements of the animal.

Grow Bulk of Feeding Stuffs on the Farm.

THE economic conditions facing the dairying industry to-day, although causing some concern to those engaged in it, have also been the means of stimulating farmers to better methods, and the many useful competitions launched by various bodies interested in the welfare of dairying clearly demonstrate the advantages obtained from the application of a sound understanding of feeding and breeding practices. The soundness of any farming practice is, of course, governed by cost, and it is intended in this article to show that the recommendations suggested may be economically carried out on a payable basis, provided the rations fed comprise farm-grown fodder crops with the addition of a small amount of concentrate, which, apart from bran and linseed meal, might also be produced on the farm. Bran, on account of its laxative properties, and comparatively high protein and mineral content, may be regarded as an essential constituent in such a ration, and combined with, say, ground maize will provide an economical concentrate for the balancing of farm-grown crops. On every dairy farm, crops are grown for grain, and especially can this be said of maize, which, when crushed through the grinder, is rendered fully digestible and is easily assimilated by the animal. Many farmers are now beginning to realise the value of ground maize. Instances have come under notice where when this concentrate has been included in the ration fed to recorded cows, an improvement in production has immediately been indicated on the record sheets of these animals.

The great value of herd recording as a means of ascertaining the value of the feeding methods employed may here be emphasised. Herd recording is not a means of computing a balanced ration, but it clearly indicates the value of different foodstuffs on either milk or butter-fat production, the result being shown not only in the total production of the herd, but also in the response by each individual cow. It shows what each cow is contributing towards the total herd production, and whether her production is economical in accordance with the feed she receives.

Better Feeding Means Healthier Cows.

It is a common practice to assess the economic value of feeding balanced rations upon the direct benefit obtained, namely, the increased production; while the farmer is primarily concerned with an immediate return for the time, labour and money expended, the less-direct benefit in improved animal nutrition is a factor which must also be taken into account. The fact that the natural fertility of so much of our land has become steadily depleted, with a corresponding mineral deficiency in the pasture, resulting in the prevalence of common stock ailments associated with malnutrition, has emphasised the necessity for something tangible being done to combat these conditions, and the subject of animal nutrition is receiving much more attention than previously throughout New South Wales. Top-dressing of pastures and the use of mineral licks is the corrective treatment recommended, but similar results may also be obtained from feeding milking cows on a properly balanced ration, especially when the ration contains a few ounces of sterilised bone-meal.

Deficiency in the food of the animal is commonly considered as a factor affecting health and production, but at times it also has an effect upon the composition of the milk. In the latter connection, the writer has in view a case where abnormal milk supplied to a cheese factory materially altered the natural rennet action in the manufacture of the cheese. Investigations proved that the trouble was not of a biological nature, but was due to an unbalanced condition of the mineral salt composition of the milk. The dairy cows producing this milk received only ordinary pasture. Later, when it was found necessary to supplement the pasture by the addition of a ration comprising chiefly silage and lucerne hay, the abnormal condition of the milk was immediately rectified. A similar improvement would no doubt have been obtained by top-dressing the pasture with superphosphate.

How to Utilise Farm Crops to Best Advantage.

With the addition of a small amount of concentrates, most farm crops grown in New South Wales will form excellent balanced rations, and by feeding the various fodders in this way their full nutritive value will be utilised by the animal and waste in feeding will be eliminated. The cutting of valuable fodder crops and throwing them in the paddocks for the cattle to eat is an instance of such waste, whereas if these crops were utilised in the correct manner better results would be obtained from the herds at very little extra cost. The method is not only wasteful from the point of view of utilising the full nutritive value of the fodders, as well as spoilage, but is objectionable from another standpoint. Dairymen have no doubt noticed that by adopting this method of feeding their cows the herd is continually being disturbed by the strong robust animals with a keen appetite, who endeavour to obtain more than their share of the feed, with the result that the younger and weaker animals in the herd are deprived of their proper nourishment.

In order, therefore, to utilise farm crops to the best advantage, they should be combined in a ration in such a way that the requirements of the

animal shall be fully provided for. The feed requirements of cows may vary with different individuals, according to the weight of the animal and the amount of milk she is producing, but generally speaking, provision of the following is of chief importance:—

1. Sufficient food to supply enough digestible nutrients for body maintenance. A certain amount of food is assimilated by dairy cows to maintain the body weight without gain or loss.

2. Sufficient food to supply enough digestible nutrients for the production of milk. This factor varies slightly according to the varying milk yield of different individuals.

3. Sufficient food to supply digestible nutrients for increase in weight when required.

4. Sufficient food to supply enough digestible nutrients to maintain body temperature and to replace the waste of tissue which is constantly going on.

Essential Food Constituents.

The foregoing constitute the nutritive requirements of dairy cows, but consideration of these requirements alone will not ensure maximum milk production. Palatability, succulence and the amount of bulk or roughage comprised in a ration have an important bearing on its digestibility. The value of a ration depends chiefly upon the digestible nutrient content, so it will be seen that in order to prepare a ration to meet the requirements of a dairy cow a knowledge of the elements comprising the digestible nutrients is essential, as it is in the ratio that these elements bear to each other that the value of the ration is assessed. The elements required by the animal for nutrients are practically the same as those required by a plant, but they need to be in a complex state of combination before they are available to an animal as food. The elements comprising the nutritive portion of the food are chiefly protein, carbohydrates, and fat. Plants or fodder crops supply all the above nutrient elements, but in order to obtain the best results from dairy stock, a balancing of the plant products according to their nutritive content is essential. In nature this occurs as the result of the animal grazing on leguminous and non-leguminous species of plants or crops, but in artificial feeding it is brought about by the feeding of plants the products of which are known as concentrates with those included under the term of roughages.

For the purpose of general artificial feeding, an understanding of the value of the various nutritive elements is necessary, and the following explanation should suffice:—

Crude Protein.—Consists chiefly of all the nitrogenous compounds of the food, and is utilised by the animal for the purpose of providing for growth, repair of muscle (lean meat) tendons, ligaments, parts of bones, brain, nerves, etc.

Carbohydrates consist chiefly of the sugar and starch compounds of the food. They are utilised by the animal chiefly for the purpose of providing heat and energy, and may be termed its fuel requirements.

Fats and Oils.—These are of similar value to the carbohydrates as animal nutrients, supplying practically the same elements. They have a higher heat and energy value than any other food constituents, and any surplus fats or oils are stored by the animal as fat. Their heat and energy value is approximately two and a quarter times that of the carbohydrates.

Farm crops and plant products differ in the percentage of the above constituents, and a knowledge of the amount of nutrients contained in the various foodstuffs enables their incorporation in a ration in the proportions required by the animal. For example, lucerne, clovers, cowpeas, soy beans, vetches, rape, etc., are very rich in protein; maize, sorghum, potatoes and mangel wurzels are very rich in carbohydrates; and cereal grains, linseed meal and cocoanut cake owe their feed value to the high percentage of oil they contain.

Roughage or Bulk.—A well-balanced ration should contain sufficient roughage or bulk. Roughage comprises the coarser foodstuffs, its function being to form bulk of food, distend the digestive tract, increase peristalsis and satisfy the appetite of the animal. By rumination or chewing of the cud the cow is able to convert rough feed such as coarse fodder crops into nutritive products.

Palatability or Relishability of a Ration.

The selection of palatable fodders in the preparation of a balanced ration has been proved an important factor in milk production, and in order to retain palatability it is essential that any change in food comprising a ration should be carried out gradually. Most dairymen have noticed that when certain fodders are first fed to dairy stock they appear unpalatable, and the cattle do not relish them. This is often the case when silage is first fed, but once the cattle have become used to this class of feed they will eat large quantities of it. Variety is a distinctly valuable factor in feeding, provided the changes are carried out gradually.

Early cut hay is more nutritious not only because of its smaller amount of fibre, but also on account of its better flavour and aroma, being more palatable and appetising. Succulent feeds also aid the animal digestion and have a beneficial laxative action, which is an important factor and especially valuable for newly-calved cows.

Tomato Fertiliser Trial—A Correction.

In our July issue (see page 511) we combined in one table the results of what would have been more correctly shown as two separate sections of a tomato fertiliser trial. The comment following the table only referred to the first section (in which the results confirmed those of previous trials) and was consequently misleading in that no mention was made of the fact that P13 (a complete mixture containing sulphate of potash) gave the highest yield in the second section, in which half of each of the fertiliser mixtures used was applied at planting and half as a subsequent top-dressing.

Dairying Notes.

OCTOBER.

Winter Pastures for the North Coast.

Lucerne a Most Valuable Pasture Plant.

PROBABLY no district on the northern rivers offered greater scope for lucerne growing than the Kyogle district, was the opinion expressed by Mr. L. McLennan, Assistant Agrostologist, after judging the winter grassland competition recently conducted by the Kyogle P.A. and H. Society.

Lucerne must always be considered one of the most valuable pasture plants in the Kyogle district, remarked Mr. McLennan. Every farm he visited during judging had some lucerne established, and in most instances it was doing particularly well, although the soils on which it was growing

Six Weeks' Winter Growth of Lucerne at Kyogle.
This stand, which is on Mr. C. A. West's farm, is four years old, is still free of weeds, and is growing vigorously.

varied from rich alluvial to heavy black clay pug. Lucerne does best on well-drained loamy soils, but will also grow satisfactorily on almost every class of soil except those on which water lies for more than a couple of days after rain, or where there is a hard impervious clay subsoil close to the surface. Many critics state that lucerne will only resist paspalum for two years, after which it will be choked out, but both Messrs. C. A. West and R. J. Moore, second and third, respectively, in the Kyogle competition, have demonstrated that by proper management—frequent renovations and (where grazed) quick grazing followed by mowing—lucerne stands

will retain their vigour for at least four or five years. Lucerne cut and fed green to cows is valuable for balancing a paspalum ration, while as hay it is one of the most valuable of stored fodders.

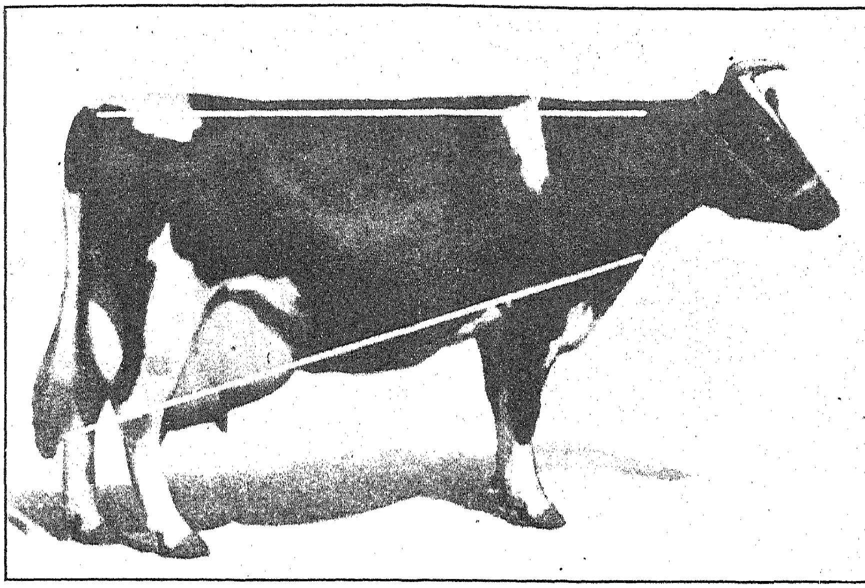
Land Must be Well Prepared.

In this competition, which was won by Mr. K. Jenkins, it was found that good pastures were invariably associated with thorough cultivation and preparation of the seed bed. To produce a high quality permanent pasture or lucerne stand the land should be fallowed for at least three months; it must be clean of weeds and paspalum, and for this reason land which

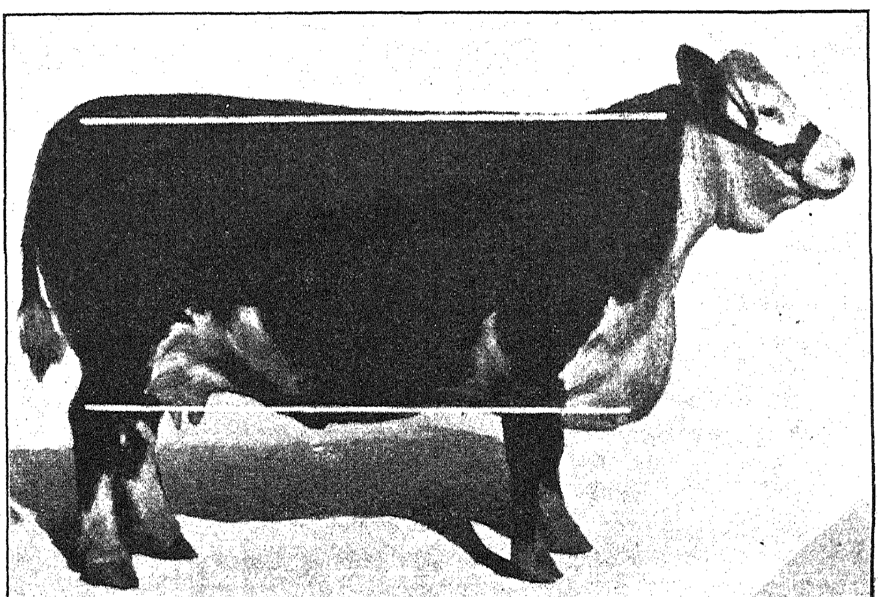
Showing the results of Top-dressing at Kyogle.

Mr. R. J. Moore top-dressed this paddock (with the exception of the strip down the centre) with 2 cwt. superphosphate per acre in the autumn. The dark-coloured portions are the heavy clover growth stimulated by the fertiliser.

has been growing crops for two or three years is preferred. High fertility demanding plants like perennial rye grass, white and perennial red clovers and lucerne will not grow satisfactorily on worn-out paddocks that have been cropped continuously for many years until humus is restored by ploughing-in green manure crops, mineral deficiencies are corrected by the application of fertilisers, and, in most cases, lime added as well. Small seed should be sown on a firm, fine seed bed, and rolling both before and after sowing is usually necessary. Best results have been obtained by sowing in April. The drill has many advantages for sowing; it gives even distribution, requires less seed per acre, cultivates the land at the time of sowing, and is very much quicker. One competitor sowed a 3½-acre paddock in two hours using 2 lb. red clover and 1 lb. white clover per acre.



Diagrammatical Illustration of the "Side Wedge" of the High-producing Dairy Cow.



Comparative View of a Good Beef Cow.

In spite of the light seeding this was easily the best paddock of clover seen during judging, being even, dense and vigorous, thus supplying definite proof of the efficiency of the drill.

Pasture Plants that do Well.

Good results were obtained by sowing perennial red and white clovers on renovated paspalum, but grasses, with perhaps the exception of Wimmera and Italian rye, developed spindly growth when sown under similar conditions. For annual pastures, quick growing plants, like Italian and Wimmera rye grass and red clover, should be sown, while for permanent pastures perennial grasses must be added. Of these certified New Zealand perennial rye grass and *Phalaris tuberosa* are best, while lucerne and white clover are also desirable additions. Cocksfoot has been unsatisfactory, but this may be due to the use of poor strains. Prairie has failed to withstand heavy stocking. Very little *Phalaris tuberosa* has so far been grown in permanent pasture mixtures, but it should prove extremely valuable, particularly because of its ability to resist dry, hot weather.

Several competitors grew oats and perennial red clover together, but Italian rye grass and perennial red clover are a more desirable combination. Sowing pasture mixtures among maize can always be recommended and satisfaction will always result from either annual or permanent pastures if the land between the rows of maize is well cultivated. It is an advantage to renovate the sown pastures in early autumn to encourage the germination of annual rye grasses that seeded the previous summer.

Hand Feed all the Year Round?

MANY men erred in the methods of management in that they allowed good cultivation land to grow pasture, said Mr. A. J. Dorsman, of Broke, at the recent annual conference of the Agricultural Bureau. He was convinced that cultivation was essential and that hand feeding, not only in the winter, but all the year round, was worth considering. It was not a difficult matter to estimate the requirements of a herd for any given period and provide for them. Saccaline sorghum gave, say, 8 tons per acre, and lucerne, say, 3 tons—an average of 5½ tons per acre. If each cow received 40 lb. per day (30 lb. greenstuff and 10 lb. dry), which was the ration Mr. Dorsman had fed with success, then with the abovementioned yields 1 acre of cultivation was required to feed one cow for 308 days.

Storage of the fodder was, of course, necessary, continued Mr. Dorsman. The Department had tried to educate farmers in the use of silos and had assisted in their construction. Many men were prevented from erecting silos by the capital outlay, but this was small when considered in relation to the value of the farm and the life of the silo. A silo of 100 tons, a hayshed, an elevator, chaffcutter and engine could be erected for £400, and would give security against conditions such as those which had obtained in the Hunter Valley for the past eighteen months, and would add value to the farm in addition to the value of the capital outlay.

The Ideal Pasture for Dairy Cattle.

THE ideal pasture should contain an admixture of grasses and clovers. A leguminous content is important in any pasture—it is essential in dairy pastures. Legumes serve a second useful purpose in Australian grasslands, namely, they increase the soil fertility. A profuse growth of pasture legumes, such as that usually associated with a dense cover of well manured subterranean clover, builds up soil condition so that the habitat is made more conducive to the growth of high-grade perennial pasture plants.

The ideal dairy pasture is one where high production perennial grasses and clovers are dominant. Climatic, soil, and economic factors often make it difficult or impossible to maintain this ideal pasture type in Australia, often because suitable perennial clovers are not yet forthcoming. In parts of temperate Australia subterranean clover offers an outstanding example of an annual legume which serves, to all intents and purposes, the function of a perennial.

Good strains of perennial rye grass, true *Phalaris tuberosa,* and improved strains of cocksfoot, are outstanding grasses of a perennial nature which are being used successfully on dairy pastures in many parts of Australia.

The above extract is taken from Mr. William Davies' report on the dairy pastures of Australia. Mr. Davies (of the Aberystwyth Plant Breeding Station, Wales) recently spent twelve months in Australia on pasture investigational work.

Facts and Figures About the Butter Industry.

FOR the 1932-33 season production in the dairy industry shows an increase in volume over all previous years, writes Mr. L. T. McInnes, Director of Dairying. Butter, which represents 82 per cent. of the total, reached 58,190 tons (1,890 tons more than the previous record), of which 55,190 tons were manufactured in factories and about 3,000 tons (estimated) on farms. The manufacture of farm dairy butter is expanding rapidly, and if the practice cannot be checked it will menace the continuation of operation of our well-equipped factories, and, by the production of a lower grade product, have a disastrous effect on marketing both in Australia and overseas.

To two main reasons is due this increase of butter manufacture on farms: (1) To the necessity of many inland dairy farmers, owing to smallness of supplies and remoteness from factory, to make butter on the farm. (2) The low payments made by factories to suppliers, owing to the averaging of the extremely low overseas realisation values with the higher Australian butter values. Where the Australian consumer pays 1s. 4d. per lb. the factory supplier only gets 8d., whereas by making the butter on the farm he is able to dispose of it to the consumer at 1s. per lb., both consumer and supplier benefiting to the extent of 4d. per lb.

The quality of factory butter during the year ended 30th June last showed another drop, only 88 per cent. being "choicest," as compared with

90 per cent. for the previous year and 95 per cent. four years ago. The drop in quality last year was confined to the older established coastal dairying areas, the inland areas showing a marked improvement in this respect.

The Prepotency of the Aberdeen-Angus Sire.

THE ability of the Aberdeen-Angus sire to transmit his qualities to his offspring was convincingly demonstrated at Grafton Experiment Farm last year. An Aberdeen-Angus bull was crossed with Guernsey, Jersey, Ayrshire, Milking Shorthorn, Devon, and Hereford cows for the production of vealers. Up to 30th June last forty-three calves had been dropped, and all were black and, with the exception of one that had stunted horns, all were poly. In other characteristics there is no appreciable difference noticeable between the different crosses, all showing the distinctive qualities of the Aberdeen-Angus sire.

The steers from Trangie Experiment Farm which were so successful in the steer competition at the last Sydney Royal Show and also at the Dubbo, Trangie and Warren Shows were by a Canadian Aberdeen-Angus bull from cows of dairy breeds. Their success in competition with animals of beef breeds supplies still further evidence of the prepotency of the Aberdeen-Angus sire.

Save the Juices Expressed from Silage.

SPOILAGE is sure to result, particularly in the surface layers of silage, unless every effort is made to exclude as much air as possible. To effect this object tramping and the application of pressure by other method are resorted to. With succulent crops, however, this is likely to tend to increase losses from another source—the draining away of the juices expressed from the silage. Fortunately, this loss can be entirely prevented by placing hay, straw or chaff in the bottom of the silo to absorb the expressed juice, which is rich in nutrients. The practice of placing chaff in the bottom of the silo is followed at Hawkesbury Agricultural College. Last season a crop of Large Red Hogan maize grown on light sandy soil was cut for silage, yielding 125 tons. Before it was placed in the silo 6 tons of wheaten chaff were placed in the bottom of the silo to absorb the superfluous juice from the maize. The juice adds relish as well as feeding value to the chaff.

Ram lambs from the Wagga Experiment Farm's Dorset Horn Stud will be available for sale this month (October), price 4½ guineas, f.o.r. Bomen, with a limited number at 3 guineas, under the Department's ram scheme. These rams will be ready for service by the end of October or early in November.

For further particulars write to the Department, Box 36A, G.P.O., Sydney, or to the Manager, Wagga Experiment Farm, Bomen.

"Orange Bush" Proved Poisonous to Stock.

GRAHAME EDGAR, B.V.Sc., Veterinary Research Officer.

THE danger of poisoning from garden plants and ornamental shrubs has been pointed out upon several occasions, but it would appear that there are still some stockowners who do not realise the risk in allowing stock access to these plants.

Quite recently a well-known breeder of dairy cattle on the South Coast trimmed a shrub known as "orange bush" (*Cestrum aurantiacum*) in his garden and threw the cuttings over the garden fence into a small paddock in which four valuable bulls were grazing. Apparently the cuttings were not touched by the bulls for two days, but on the evening of the third day they were seen eating them. The following morning one bull was found dead, while the other three were very sick and showed symptoms of acute abdominal pain. These latter bulls died during the day.

Post-mortem examinations were conducted by Mr. B. C. Veech, Government Veterinary Officer, who found lesions of acute gastro-enteritis. The history of the mortality was suggestive of plant poisoning, and specimens of the plant were submitted to the Director of the Botanic Gardens, who identified it as *Cestrum aurantiacum*. Portion of the rumen contents of one of the bulls was also examined botanically and a considerable quantity of the plant was identified in the ingesta.

The plant, which is a native of Guatemala, grows to a height of from 4 to 6 feet. It possesses a fairly large leaf, approximately 5 inches long and 2½ inches wide, and has a small orange-coloured flower which occurs in clusters along the stem.

In testing the plant for toxic properties a watery extract from 1 lb. of leaves was prepared and administered to a sheep as a drench. Two hours after drenching the sheep appeared uncomfortable, and was found dead after sixteen hours. Upon post-mortem examination, lesions of acute gastro-enteritis were found. The appearances of the lesions, both in the bulls and sheep, showed that the toxic principle is of an extremely irritant nature. It is apparently soluble in water.

Cestrum aurantiacum, which is an introduced garden plant, is one of a number of plants and shrubs which, useful for ornamental purposes, are likely to cause illness and death in stock.

This and similar mortalities illustrate the danger of allowing animals to have access to such plants, since losses may follow direct browsing upon the growing plant or the ingestion of cuttings and clippings carelessly left in the paddock.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date.
Lunacy Department, Parramatta Mental Hospital	12	1 Oct., 1933
Department of Education, Gosford Farm Homes	38	2 ,, 1933
James McCormack, Tumut	98	9 ,, 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 ,, 1933
E. C. Nicholson, Jillamatong, Corowa	180	23 ,, 1933
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	43	25 ,, 1933
G. Powell and Sons, "Loch Lomond," Armidale	22	26 ,, 1933
E. S. Cameron, Big Plain, Narrandera	31	26 ,, 1933
E. E. McMullen, Springnook, Holbrook	31	3 Nov., 1933
W. R. Boughton, Holbrook	33	3 ,, 1933
C. Maynard, Holbrook	12	3 ,, 1933
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1933
Stace Bros., Taylor-street, Armidale	26	1 Dec., 1933
Department of Education, Brush Farm, Eastwood	8	3 ,, 1933
Lunacy Department, Morisset Mental Hospital	29	7 ,, 1933
W. W. Martin, "Narooma," Urana Road, Wagga	150	14 ,, 1933
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1933
E. E. Winder, Wybong Road, Muswellbrook	40	22 ,, 1933
C. J. Parbery, Allawah, Bega	122	8 Jan., 1934
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay ...	8	9 ,, 1934
G. H. Hooper, Oak Hill, Bethungra	10	19 ,, 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	81	22 ,, 1934
A. L. Logue, Thornboro, Muswellbrook	45	25 ,, 1934
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	13	27 ,, 1934
J. B. Burtenshaw, "Sunnyside," Inverell	42	27 ,, 1934
Parker Bros., Hampton Court Dairy, Inverell	82	27 ,, 1934
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1934
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1934
W. K. Frizell, Rosenstein Dairy, Inverell...	37	2 ,, 1934
W. Pigg, Redlands Dairy, Inverell	27	2 ,, 1934
A. N. de Fraine, Happy Valley Dairy, Inverell	28	3 ,, 1934
G. L. Genge, "Easton," Armidale	39	7 ,, 1934
J. Davies, Puen Buen, Scone (Jerseys)	244	9 ,, 1934
Forster & Sons, Abington, Armidale	189	12 ,, 1934
Newington State Hospital and Home	91	16 ,, 1934
A. B. Finney, Fox Ground, Gerringong	33	17 ,, 1934
Lidcombe State Hospital and Home	153	20 ,, 1934
Lunacy Dept., Gladesville Mental Hospital	34	22 ,, 1934
Riverina Welfare Farm, Yanco	89	24 ,, 1934
Department of Education, Yanco Agricultural High School	39	24 ,, 1934
W. J. Miller, 199 Mann Street, Armidale	7	6 Mar., 1934
New England Girls' Grammar School, Armidale...	41	8 ,, 1934
F. C. Butler, Yarranung, Bega	122	24 ,, 1934
G. W. Young, "Boorganna," via Wingham	39	30 ,, 1934
Hawkesbury Agricultural College, Richmond (Jerseys)	118	3 April, 1934
A. D. Frater, "Fairview Dairy," Inverell	61	5 ,, 1934
Cowra Experiment Farm	26	27 ,, 1934
St. Joseph's Girls Orphanage, Kenmore	10	4 May, 1934
G. A. Parish, Jerseyland, Berry	93	5 ,, 1934
Marion Hill Convent of Mercy, Goulburn	27	5 ,, 1934
St. Joseph's Convent, Reynold-street, Goulburn	4	5 ,, 1934
St. John's Boys' Orphanage, Goulburn	18	5 ,, 1934
W. M. McLean, Five Islands Road, Unanderra	76	6 ,, 1934
Koyong School, Moss Vale	3	8 ,, 1934
Miss N. C. Brenan, Arankamp, Bowral	15	10 ,, 1934
Tudor House School, Moss Vale	21	13 ,, 1934
Limond Bros., Morisset	38	1 June, 1934
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 ,, 1934
Hurlstone Agricultural High School, Glenfield	44	22 ,, 1934
Berry Experiment Farm, Berry...	145	13 July, 1934
Grafton Experiment Farm	271	14 ,, 1934
Australian Missionary College, Cooranbong	62	19 ,, 1934
William Thompson Masonic School, Baulkham Hills	37	20 ,, 1934
A. A. Campbell, Breadalbane, Mullumbimby	51	16 Aug., 1934
P. Ubrihien, Corridgeree, Bega	129	17 ,, 1934
E. W. Flower, Binna Burra	66	17 ,, 1934
St. Patrick's College, Goulburn	8	21 Sept., 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 ,, 1934

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
Wagga Experiment Farm (Jerseys)	65	25 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone	92	9 Nov., 1934
Wolaroi College, Orange	11	10 " 1934
J. L. W. Barton, Wallerawang	16	17 " 1934
Wollongbar Experiment Farm, Lismore (Guernseys)	123	11 Jan., 1935
George Rose, Aylmerton	2	21 Feb., 1935
Mittagong Farm Homes	36	22 " 1935
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	19	23 " 1935
T. H. Maples, Racecourse Farm, Bega	48	2 Mar., 1935
P. M. Burtenshaw, Killean, Inverell	63	28 " 1935
J. P. McQuillan, Bethungra Hotel Bethungra	25	4 April, 1935
W. Newcomb, "Minnamurra," Inverell	85	6 " 1935
Lunacy Department, Kenmore Mental Hospital	84	4 May, 1935
St. Michael's Novitiate, Goulburn	4	4 " 1935
Rydalmere Mental Hospital	65	11 " 1935
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	261	28 June, 1935
St. John's College, Woodlawn, Lismore	34	29 " 1935
W. S. Turnbull, Flanders Avenue, Muswellbrook	37	28 July 1935
Sacred Heart Convent, Bowral	12	3 Aug.' 1935

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis :—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—MAX HENRY, Chief Veterinary Surgeon.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free.

Owner and Address.	Number in herd.
Martin Bros., "Narooma," Urana Road, Wagga Wagga	86
Cann, H. J., The Gap, Alstonville	...
White, F. J. and Sons, Bald Blair, Guyra	238
Mott, T., Main Arm, Mullumbimby	26
Henderson & Son, Upper Wantagong, Holbrook	95
Hawk, J. T., Ben Lomond	42
Sams, C. R., Wilson's Creek, Mullumbimby	34
Walker, Jas. R., "Strathdoon," Wolseley Park	32
East, N. A. L., East Valley, Gum Flat, via Inverell	51

—MAX HENRY, Chief Veterinary Surgeon.

INFECTIOUS DISEASES REPORTED IN AUGUST.

The following outbreaks of the more important infectious diseases were reported during the month of August, 1933 :—

Anthrax	Nil.
Blackleg	10
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	Nil.
Swine fever	Nil.
Contagious pneumonia	4
Necrotic enteritis	1

—MAX HENRY, Chief Veterinary Surgeon.

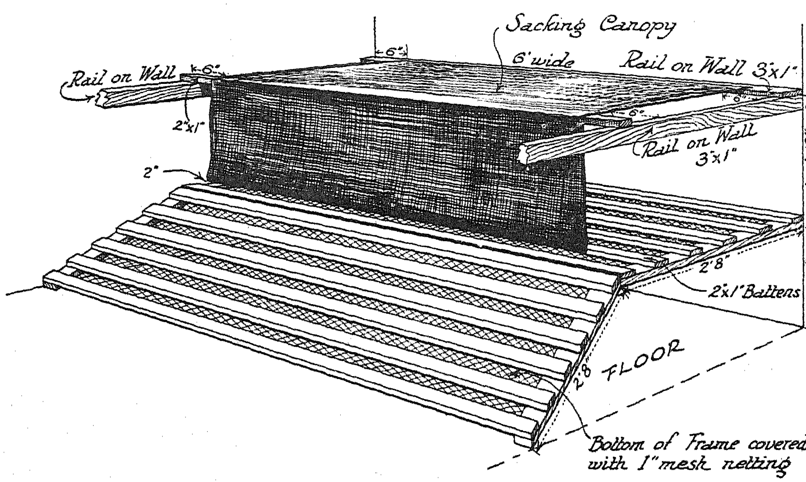
Poultry Notes.

October.

E. HADLINGTON, Poultry Expert.

A New Method of Teaching Chickens to Roost.

Many poultry farmers suffer losses among young stock after they leave the brooders owing to not providing suitable accommodation and means of teaching the chickens to roost as soon as possible. The chickens after being removed from the warm brooders should be housed in cosy quarters until they have learned to roost. A suitable type of house was illustrated and described in these *Notes* previously, but those requiring particulars can obtain a leaflet on housing from the Department, giving full details and plans of the type of building found most effective on Departmental and many private farms.



Structure on Which to Teach Chickens to Roost.

Experiments have been carried out on one of the Departmental farms during the past couple of seasons with a new method of teaching the chickens to roost after they are taken from the brooders. The accompanying illustration depicts this method, which has been found very satisfactory and is an alternative to the use of spaced battens previously advocated by the Department. The idea is to construct two frames each 2 feet 8 inches wide and long enough to go across one end of the pen. These frames are made of 2 by 1 inch Oregon with slats of the same material spaced 4 inches apart, under which is fixed 1-inch mesh wire netting to prevent the chickens falling through. One frame is place in a horizontal position

18 inches from the floor and the other is sloped at an angle of about 35 degrees from the horizontal frame to the floor so that the chickens can run up the sloping frame on to the horizontal one. The wire netting may be tacked on with the edges underneath the frame so that there is no difficulty in cleaning the frames. If the chickens have to be removed from the brooders earlier than they should be, or if they are taken out during a cold spell, it is advisable to place some sort of cover over the horizontal frame so that the chickens may be kept warm for the first few days. For this purpose a bag canopy tacked on to the end wall at a height of about 15 inches and draped over a batten to within 2 inches of the level frame, as shown in the illustration, will be found a suitable means of making the chickens snug. A space should, however, be allowed at each end of the canopy for the free circulation of air.

It is found that very little difficulty is experienced in inducing the chickens to go up on these frames, and after about a week the ordinary perches may be placed in position so that the chickens can get on to them off the frames. When the majority of the chickens have taken to the regular perches, the sloping frame may be removed and the horizontal one placed in a sloping position with one side about 6 inches above the floor so that the few chickens which have not taken to the perches will be prevented from camping on the floor. Where several sets of these frames are in use this would release one frame out of each house where most of the chickens had learnt to roost, so that they could be used in other pens.

Washing Dirty Eggs for Incubation.

THE question as to whether it is harmful to wash dirty eggs when they are being placed in the incubator has often been raised, but up till the time that this Department carried out trials no definite information based upon properly conducted experiments was available to say whether any harm resulted from the washing of such eggs. During the past three years experiments have been carried out by the Department with a view to settling this question. In 1931 a test was laid down, using dirty eggs washed and as a check the same number of clean eggs unwashed and clean eggs washed, all from the same pens. These were hatched in the same incubator with the following results:—

Dirty eggs washed hatched 66 per cent. of fertile eggs.
Clean eggs unwashed hatched 72 per cent. of fertile eggs.
Clean eggs washed hatched 73.5 per cent. of fertile eggs.

In 1932 a further test was laid down, but owing to a mishap with one lot the experiment was abandoned. During the present season three separate tests were carried out at Hawkesbury Agricultural College, 200 eggs being used in each test and equal numbers of eggs from the various pens were used in each lot so as to ensure uniformity. The eggs were hatched in an electrically-heated incubator of the forced draught principle.

TABLE showing Relative Hatchability of Washed and Unwashed Eggs.

	No. of Eggs Set.	No. Infertile.	Hatched.	Percentage from Fertile Eggs.
First batch set 21st July—				
Clean unwashed	50	6	37	84
Clean washed	50	6	38	86
Dirty unwashed	50	7	35	80
Dirty washed	50	5	35	78
Second batch set 9th September—				
Clean unwashed	50	3	33	70
Clean washed	50	9	27	66
Dirty unwashed	50	5	35	77·7
Dirty washed	50	5	35	77·7
Third batch set 14th September—				
Clean unwashed	50	3	37	78·7
Clean washed	50	6	35	79·5
Dirty unwashed	50	4	37	80·4
Dirty washed	50	1	32	65·3

From these results it may safely be concluded that the washing of dirty eggs does not seriously affect their hatchability, and it would certainly be preferable to wash the dirty eggs, particularly in cases where there may be risk of infection by diseases, such as bacilliary white diarrhœa and coccidiosis.

The Poultry Farming Industry.*

DURING the past few years there has been rapid development in the poultry industry in New South Wales, perhaps partly due to more organised marketing facilities, but mainly to the general economic position causing many people to go on the land as a means of rehabilitation, and poultry farming has afforded them an opportunity of becoming established on a smaller capital outlay than would be necessary for other larger farming operations. The time has passed when poultry farming, as a specialised business, might be regarded as a doubtful undertaking, as many hundreds of people have, for years past, been making a living entirely from poultry husbandry, and there are now at least a few farms in this State carrying from 8,000 to 10,000 layers.

Three years ago I had the privilege of visiting some of the largest poultry-farming centres in Britain and America, and I was agreeably surprised to find that some of our largest and best farms compare very favorably with the leading farms in those countries. Of course, there are larger farms overseas, but, contrary to the general impression that America is the home of huge poultry ranches, I found that farms carrying 8,000 to 10,000 layers were regarded as among the largest in that country, and while our American cousins may lay claim to some of the most extensive undertakings in other spheres, the largest poultry farm in the world is situated in Scotland, near Edinburgh. There the Buttercup Dairy Company has a poultry plant for supplying eggs and poultry to their several

* Notes from an address delivered to the Parramatta branch of the Rotary Club.

hundreds of chain shops. This farm covers an area of about 100 acres, which is practically covered with poultry buildings and runs, having a capacity, it is stated, of 200,000 layers. Some idea of the immensity of the farm may be gathered from the fact that seven miles of tarred roads have been laid down for access to the pens. A feature of the farm is that it is worked entirely by a staff of about 100 girls, and electric appliances are employed to the fullest extent for labour saving. Although this farm is outstanding from a spectacular point of view, it is questionable whether it would be successful under ordinary commercial conditions, owing to its being so highly capitalised.

The business people in some of our poultry-farming centres do not always realise what a factor the industry is in the prosperity of their town. Take Parramatta, for instance. Approximately £300,000 worth of eggs and poultry are produced annually within a radius of 10 miles of this town, in addition to which probably £30,000 worth of day-old chicks are sold, and £200,000 is expended on supplies to produce this income. Probably if the townspeople of Parramatta visualised what they owe to the humble hen they would, like the people of Petaluma, California, erect a statue of a hen in the main street.

Cost of Establishing a Poultry Farm.

It should not be thought that poultry farming is a simple occupation which may be taken up when everything else has failed, and it must be realised that among the main essentials for success are sufficient capital to provide proper equipment, an aptitude for the work, keen observation, an infinite capacity for details, and the realisation that it involves working early and late practically seven days per week, particularly during the half of the year when the chickens are being raised.

The cost of establishing a poultry farm is often under-estimated by those entering the industry, with the result that many invest a few hundred pounds of hard-earned savings in a farm, struggle along for a year or so, and then find that they have undertaken a hopeless task; hence the reason for numerous farms being on the market. To put the matter of cost of working up a farm in a nutshell, it may be stated that the expenditure will amount to at least £1 for each layer, exclusive of providing a residence, which means that to establish a farm carrying 1,000 layers would cost £1,000, plus a dwelling. This amount would cover the purchase of five acres of land, the materials for poultry buildings, breeding stock or chickens to commence, sundry tools and appliances, and living expenses (30s. per week) for two years while the flock was being built up. It will be noted that no allowance is made for labour, it being assumed that the farmer would erect his own buildings and runs. This expenditure would only provide bare essentials, but is based on erecting buildings, which, while not being elaborate, would be a lasting asset.

It may be contended that many of the most successful farms of to-day were started on a very small capital, which is quite true, but in such cases the farmer had other means of earning a living while the farm was being

built up, and it may have taken a number of years to reach the point where the farm was self-supporting. The position to-day of the majority of people taking up poultry farming is that they have no employment, so that the amount of capital available has to cover the cost of building up the farm and also living expenses for two years while increasing the flocks. The question may be raised as to why the farm could not be stocked in one year so as to obtain a quicker return. This, however, is not practicable, because it is not possible to buy laying stock at a price which would return a profit, and to attempt to rear sufficient chickens in one year to stock a farm would involve an outlay of twice as much in buildings and equipment as would be necessary to work it up in two years.

Reduced Returns in Recent Years.

While poultry farming is, perhaps, still one of the best paying small industries, the returns during the past couple of years have been adversely affected in common with all primary products, while the fact that many hundreds of people have taken up poultry farming during that time has also tended to bring down prices. As a matter of fact, the time has arrived when a much greater increase in production of eggs would mean that saturation point would be reached, notwithstanding the fact that there has been an enormous increase in the number of eggs exported from New South Wales, amounting to a total of 6,000,000 dozen last year. The period over which export can be carried on is limited, and our population is not large enough to consume many more eggs than are produced at present. The position is also accentuated by the influx of eggs from other States, due to the better market prices ruling in Sydney. To relieve the local market of the surplus production it is necessary to commence exporting so early that a definite loss is incurred on all eggs despatched during the first couple of months of the exporting season, and it is essential that eggs be shipped away a couple of months later than is safe from the point of view of covering expenses. Were it not for organised marketing under the control of the Egg Marketing Board it would not be possible to carry on export operations on such an extensive scale, and the returns to the poultry farmer would be considerably less than at present. The loss sustained on early and late exports has to be made up by profits during the middle of the season and the penny per dozen pool contribution made by poultry farmers. It, therefore, means that unless something can be done to stimulate local consumption of eggs, or other markets can be found overseas, which is not likely at present, there cannot be much more extension of the industry without lower prices to the producer, and when it is pointed out that the return per hen at the present time is only just half what it was in normal times it will be realised that the industry could not stand any further reduction. On last year's returns a well-managed farm, carrying a flock of 1,000 layers, would only produce an income of £250, out of which would have to be deducted any interest on capital, rates and taxes, etc., thus the poultry farmer does not receive much to compensate him for long hours and the capital invested.

1st *November*, 1933.

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Vol. XLIV. Part 11. November 1, 1933.
Agricultural Gazette of New South Wales.

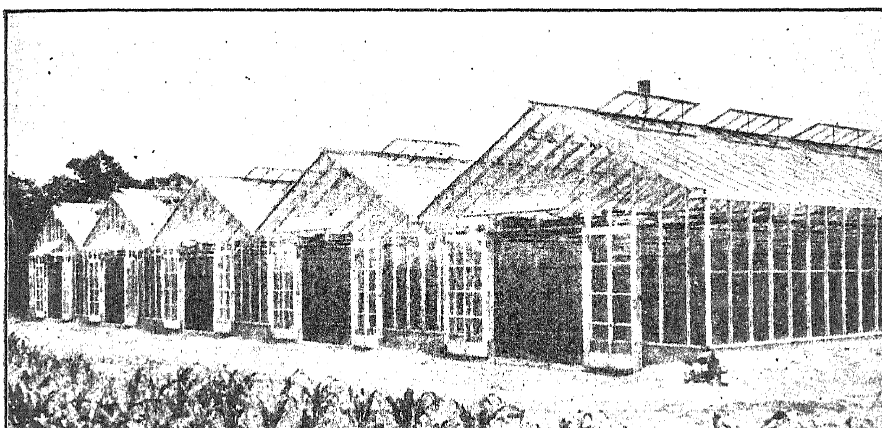
Glass-houses Here and Abroad.

Some Interesting Comparisons.

JOHN DOUGLASS, H.D.A., H.D.D., Senior Agricultural Instructor.

The chief glass-house districts of U.S.A. are situated in densely-populated industrial centres, or in the northern states where the population during the winter depends upon the southern states for vegetables. In Canada the houses are situated in the thickly-populated areas. The chief glass-house tomato-growing district of England is Lea Valley, which is on the outskirts of London. During my recent trip abroad I spent some time investigating the types of houses built in each of these countries, the crops propagated, the research and cultural methods followed, and the business side of the industry.

In New South Wales and South Australia the chief crop grown under glass is the tomato. I was interested in the fact that glass-house tomato



A Type of House Suitable for Australian Conditions.
Note the lightness of construction, ample ventilation, wide doors to allow entry of vehicles, high side walls and dwarf concrete foundation wall. The overhead irrigation and heating pipes are also visible.

growers in other countries obtained on the average about twice the yield of our local growers. There are many factors which contribute to the better results obtained abroad.

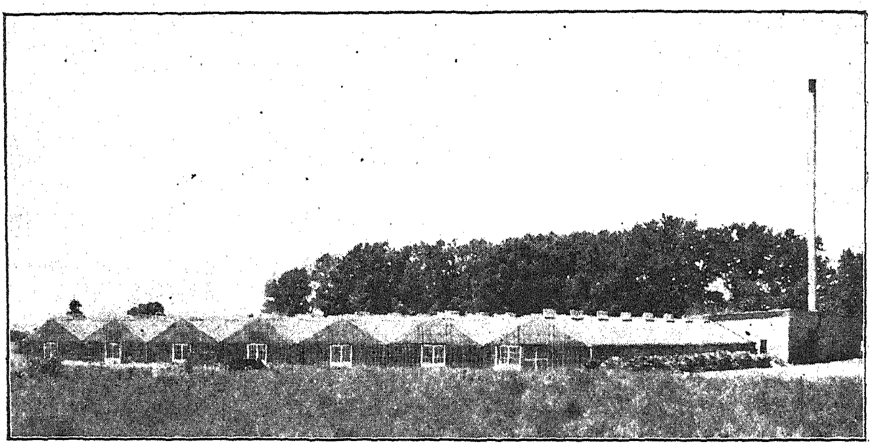
Type of House a Big Factor.

The type of glass-house, more than any other factor, influences yields. In U.S.A. and Canada there are many types, the chief ones being known as the "ridge and furrow" structures and "super" glass-houses. In England

the greatest area under glass is covered with ridge and furrow types. This type, although not known by that name, is very common in Australia, but differs in many important points from those in England.

The area covered by individual houses abroad is very much greater than here, and it is an advantage in that it helps to maintain a much more even temperature and better air conditions. Another important point of difference is in regard to solidity of structure. Despite all that has been said about the climate in Australia not being cold enough to warrant expensive houses, my contention is that if the industry is to be established on a permanent basis and payable results are to be ensured over a number of years, it is just as necessary to have solidly-built houses here as it is in England.

The time is long past in Australia when growers could build a very light cheap structure and be sure of excellent returns. As in every other country

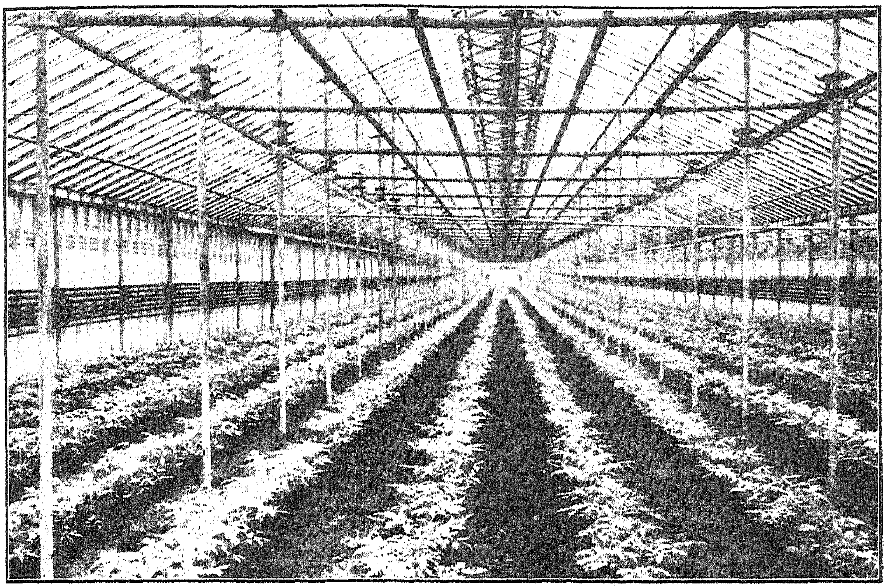


A Battery of Glass-houses in Ohio Covering 1½ acres.
The heating and sterilising plant chimney on the right is 100 feet high.

of the world Australian growers must look on glass-house culture as a stable business proposition and not as a get-rich-quick scheme. In Canada and U.S.A. growers are content to obtain returns from their investments which will cover expenses, give the operators a fair salary and return about 15 per cent. on the capital invested. It is very doubtful if, on the average, the industry in Australia pays as well as this, even with our comparatively good climatic conditions, cheaper houses, low running costs, etc.

Permanent Structures Favoured.

Houses in other countries are built as permanent structures, and although a certain amount of upkeep is involved, they last indefinitely. Overseas growers, unlike our local men, cannot under these circumstances, give consideration to a change of soil by moving the houses to fresh ground. They maintain soil fertility by practising crop rotation and manuring, and keep the soil and houses free of diseases and pests by sterilising and adopting

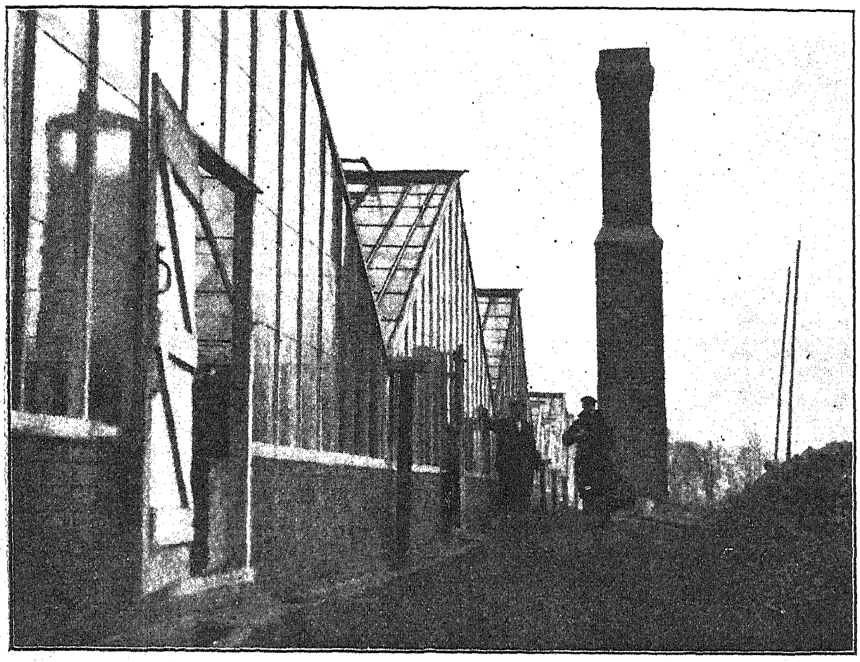


A Typical Steel-pipe Frame Glass-house in Ohio.
Note the heating pipes on the walls and the ridge ventilation.

This Glass-house is Twenty-five Years Old.
It is of the ridge-and-furrow type and is without posts.

hygienic cultural methods. I inspected several overseas glass-houses twenty-five years old and found them unimpaired by age and more up-to-date than anything in New South Wales at the present time. The initial cost of these permanent glass-houses is a good deal more than that of temporary structures, but the initial cost is practically the only cost.

At the present time the most progressive growers in New South Wales are doing fairly well with cheap structures, but will have great difficulty in maintaining payable returns when the houses deteriorate. The only good point about these temporary structures is their cheapness; the defects are numerous.

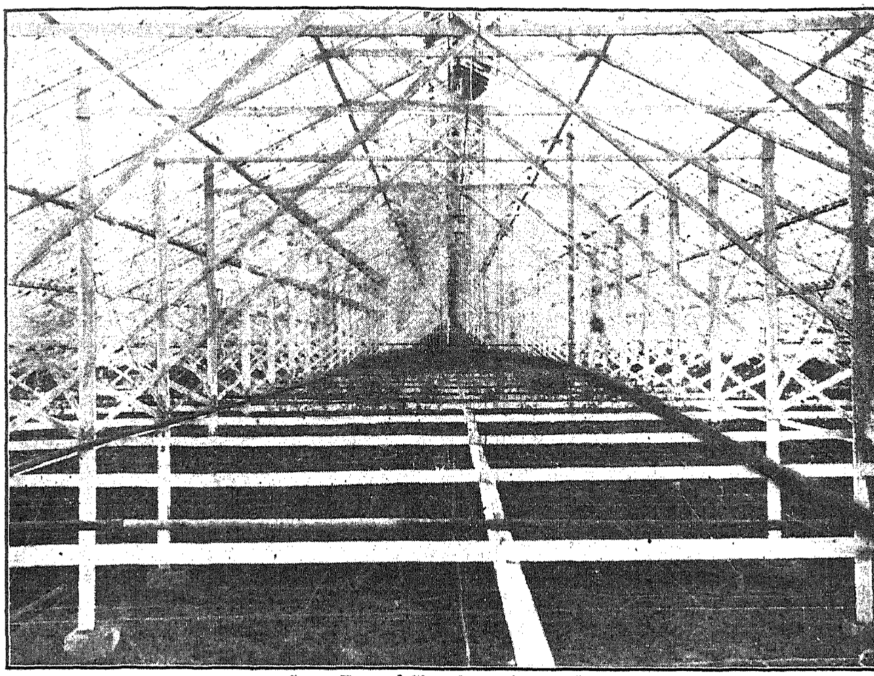


Typical English Glass-houses.

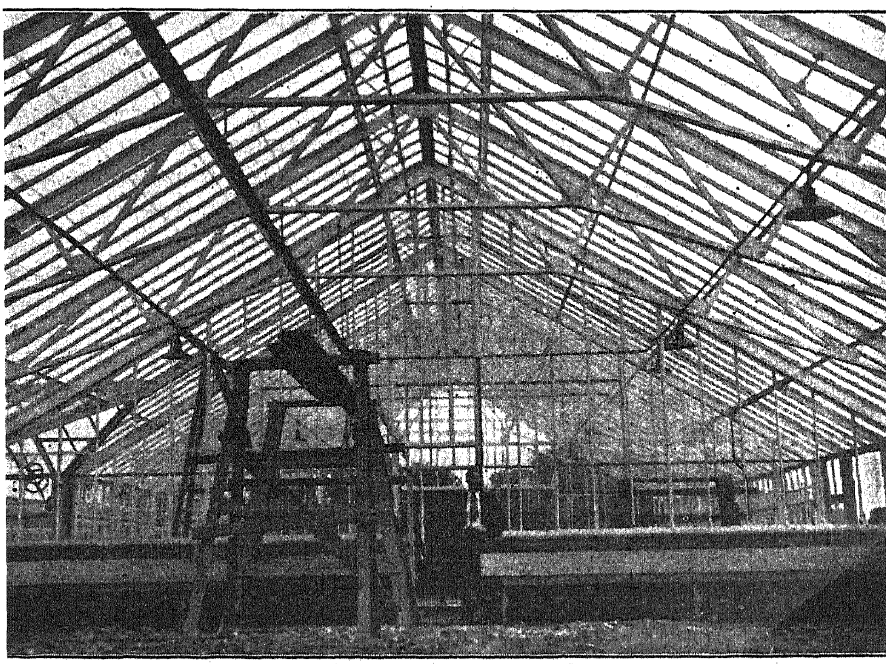
Disadvantages of Temporary Houses.

In the first place, owing to lack of heating facilities, faulty ventilation, structural defects, etc., we are strictly limited in the range of varieties of tomatoes which can be grown. Tomatoes which will withstand low and varying temperatures, and those which pollinate at a low temperature, are the only ones that can be successfully cultivated. The better-quality, heavier-yielding types are unsuited by the conditions in our type of glass-house. Furthermore, the fact that the standard height of the walls of local glass-houses is only 4 feet prevents the growing of tall varieties.

The heavy losses occasioned by Irish blight each year in New South Wales are due in a large measure to the faulty construction of the houses. Several of the leading growers in Ohio (U.S.A.) had never heard of this



Super Type of Glass-house in Canada.
Note the men standing under the cross girders, also tomato plants showing above the girders, which are ten feet from the ground.



The Latest Type of American Glass-house.
Being built for the New York State Department of Agriculture.

disease. Nematodes are more serious in Ohio tomato fields than in our tomato districts, but the trouble is reduced to a minimum in their glass-houses, as are certain fungous diseases (including Fusarium), by adopting soil sterilisation as a routine practice.

Finance is a Stumbling Block.

Even after inspecting several thousand of acres of glass-houses in America and Europe, it is difficult to decide upon the ideal type for conditions in this country. The one and only factor which prevents a definite decision being made is the question of cost. The situation of the land on which the house is to be built will, of course, also considerably influence the decision as to the best type of house to construct. Undoubtedly the steel framed, artificially heated, super type of glass-house is the ideal. I had the good fortune to see one being built for the New York State Department of Agriculture. The accompanying photograph will give you some idea of the completeness of this structure.

For growers with a fair amount of capital I consider that modifications of the superstructure type would give excellent results in this country. Those already in the industry, however, are recommended, for the present at any rate, to make a further outlay to improve their existing houses rather than to invest in the more expensive types.

Some Desirable Features.

The ideal glass-house should embody the following features, thus making it possible to grow, each season, heavy-yielding crops of tomatoes of the best quality.

In the first place the house should be as nearly air-tight as possible. This gives the operator satisfactory control over temperature and humidity. An air-tight house prevents the escape of warm air during the night and thus maintains a higher temperature more economically than does a leaky house. Air-tightness also allows of effective fumigation.

The next consideration in deciding upon the ideal for Australian conditions is the matter of adequate ventilation. The health of the plants depends a good deal upon ventilation. At present during the winter months the practice is not to ventilate, and the plants are saved from serious damage and even total destruction only by "accidental" ventilation through the glass cracks, channels of the rafters, etc. Even in snowy, winter weather overseas growers make a point of ventilating the houses as often as necessary. The fact that these houses are heated does not make this operation any more necessary than in our temporary structures.

The wall heights of overseas houses vary considerably, but the average is somewhat higher than our tallest. The larger glass-houses in America have a standard 8 feet wall. I consider that the ideal Australian type should have walls at least 6 feet high. The extra expense incurred will be well repaid by the ease of working and the many other obvious advantages.

Another noticeable feature in all overseas glass-houses was the low concrete or brick foundation wall. This wall varied in height, and could, with advantage, be incorporated in designs for this country, especially as concrete is relatively cheap. In the first place this concrete foundation wall eliminates rotting of the wooden bottom wall plates. Its chief advantage, however, lies in the fact that it is more effective than other materials in excluding frost and cold air, which is coldest at ground level. In the case of our present structures the cold gains entrance through cracks and by direct radiation through the glass. Another advantage is its permanency and negligible cost of upkeep as compared with renewal charges where the wooden structure rests on the ground.

The construction of glass-house roofs, guttering, etc., in the modern types of glass-houses is very efficient. In the first place, only the best seasoned wood glazing bars are used. The glass is puttied in with elastic (non-hardening) putty so as to make a rainproof roof. Along the inside of the rafter small furrows (or gutters) are made in order to carry off the water which condenses on the inside of the glass. This makes the roof drip-proof. Trussing of the roof should always be carried out with the object of eliminating as many posts as possible.

(*To be continued.*)

Applications Invited for the Government Farrer Scholarship.

The Government Farrer Scholarship, tenable in the Agriculture Diploma Course at Hawkesbury Agricultural College, Richmond, will be open for competition in January next.

The award of the scholarship will be made on the results of the Intermediate Certificate Examination, subject to consideration of the candidate's aptitude, fitness, physical strength and other qualifications necessary to become successful in agricultural work. The award will be made on the aggregate marks obtained in six subjects at the examination in question, such subjects to include English, Mathematics 1, and four others to be selected from specified groups. The scholarship will be open for competition to candidates who are not less than 16 nor more than 19 years of age on 1st February, 1934, and who are natural born or naturalised subjects of the King. Candidates or their parents must have had six months' continuous residence in this State immediately prior to 1st February next. The duration of the scholarship is three years in the case of a holder entering the first year, and two years where he is qualified to enter the second year of the course, and will cover fees, cost of text-books and other expenses up to a maximum of £40 per annum. Any charges or expenses in excess of that amount will require to be met by the student.

Applications from persons desirous of competing for the scholarship must reach the Principal not later than 5th January, 1934. Further particulars are obtainable from the Under-Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney, or from the Principal, Hawkesbury Agricultural College, Richmond.

Potato Cultivation Often Overdone.

LOCAL PROGRESSIVE METHODS IN LINE WITH OVERSEAS IDEAS.

The harmful effects of deep inter-row cultivation of the potato crop has frequently been noted in this State during dry seasons, stated Mr. A. J. Pinn, Special Agricultural Instructor, recently. Main crop growers, particularly in the western and southern districts of this State, have arrived at the conclusion that frequent shallow cultivations during the early stages of growth are of prime importance. A review of the methods adopted by the competitors in potato crop competitions over a number of years reveals the fact that most of these growers also practise frequent, early and level cultivations. These workings are effected chiefly by the use of harrows when the crop is breaking ground, and even when the plants are 8 to 10 inches high.

Evidence as to the progressiveness of these methods is contained in a recent issue of *The American Potato Journal,* from which the extracts below are reprinted, and which states that the more frequent use of the weeder early in the season, or until the plants are 8 to 10 inches high, and less inter-row cultivation are now recommended to growers throughout New York State. This has been proven to be both cheaper and more effective than the present system of weed control.

The Primary Object of Cultivation is to Kill Weeds.

THE proper cultivation of potatoes is an art dependent on good judgment and a knowledge of the general principles involved, rather than a science which can be reduced to set rules. From the previous generation of soil scientists we inherited a number of theories, such as the conservation of soil moisture by a surface mulch, stimulation of soil bacteria and nitrification through the aeration of the soil, and so forth. These could be demonstrated in the laboratory, but most of them somehow failed to prove out in field experiments, which are the real and final test of any theory. In repeated experiments with corn, and more lately on Long Island (U.S.A.), with potatoes, cultivation has caused a decrease as often as an increase compared to plots where the weeds were simply scraped off with a hoe and the soil never stirred. Where the weeds were allowed to grow yields were naturally extremely low.

When all is said we come back to the original idea of cultivation, namely, that the primary object is to kill weeds. Some form of cultivation is, so far, the only economical means of weed-killing devised. If weed growth is controlled, in the rows as well as between them, further stirring of the soil will apparently accomplish little, and often reduces the yield, though there is some evidence that in years of extreme drought, like 1930 (in U.S.A.), it may be slightly beneficial.

Why Cultivations Should be Early and Shallow.

Someone has suggested the term "birth control" for the killing of the first few crops of weeds, through the use of the harrow and weeder, before the potatoes are above ground. The time to kill weeds is while they are small

and weak, not after they have become firmly established and deeply rooted. The spike harrow or weeder also gets over the ground much more rapidly than the row cultivator. Where the seed pieces are planted fairly deep the harrow can be run deep enough to loosen the surface soil thoroughly, and can even be used after the potatoes are up with little or no damage. In 1928 the Pennsylvania 400-Bushel-Club members harrowed an average of 2.3 times, some as many as four times.

The first inter-row cultivation may be, and under some conditions should be, deep and fairly close in order thoroughly to loosen up the soil compacted between the rows in planting, and to allow heavy rains to penetrate rapidly. As soon as the roots begin to spread out, however, especial care should be taken to prevent root injury. Tearing off roots is a mutilation of the plant which will check and sometimes permanently injure its development. When good-sized potatoes are cultivated closely or deeply, the whole field may sometimes be seen to wilt in the hot sun, even though the soil is not very dry. Such cultivation does more harm than it can possibly do good.

When wet weather has prevented normal cultivation until weeds have attained some size, a set of sweeps will cut the weeds below the surface, but need not be run deep enough to tear the potato roots severely. Otherwise, deep and damaging cultivation will be necessary.

Is the Value of a Soil Mulch Over-emphasised?

Writing in this same journal, E. V. Hardenburg, of the Cornell University (N.Y.), suggests that the primary function of cultivation is weed control. Increase in potato yields resulting from the maintenance of a soil mulch to conserve soil moisture, he says, has been over-emphasised. This has been shown, he claims, by the results of recent experiments reported by the Cornell University and the Pennsylvania Experiment Station. In both of these experiments, running four to five years, plots receiving three to five cultivations yielded as well as plots cultivated eight or more times. Similarly, plots in which the soil was never stirred and weeds were controlled by scraping or cutting yielded as well or better than the cultivated plots. The conclusion is that cultivation may be overdone, particularly during periods of drought, where weed control does not require it, and late in the season when tillage results in serious root damage.

After dealing fairly exhaustively with the subject, Hardenburg arrives at the conclusion, based on the results of recent experiments, that it usually pays best to cultivate potatoes only a sufficient number of times to control weeds effectively, and that the best potato grower is not the one who cultivates most often, but rather the one who handles his weed problem with fewest cultivations and at lowest cost.

Ridge versus Level Cultivation.

Another debated point, says J. B. R. Dickey, of Pennsylvania State College, is as to whether potatoes should be ridged or hilled up. Practically all cultivation experiments (in U.S.A.) show better yields from level cultivation, as less moisture is lost by evaporation and the roots are less

disturbed. If weeds in the row have been allowed to develop beyond the stage where the weeder will kill them, they may sometimes be smothered by ridging. Again, if there is danger of the tubers pushing out and getting sunburned, it may be well to throw some dirt to the row. In either case, ridging should be regarded as an evil which may or may not be necessary. There is much less excuse for ridging with late potatoes, which if planted well down in the ground will not set close enough to the surface for exposure to be serious. Ridged potatoes are doubtless easier to dig, but something is usually, if not always, sacrificed in yield to gain this advantage.

Writing in reference to the same subject, Hardenburg says that although ridging does not appear to have a large influence on the amount of sunburn injury, the study of 105 farms in 1931 and 171 in 1932 showed consistently less injury in those fields ridged highest. In view of the fact that extreme ridging, applied when the plants are large and growing rapidly, usually results in loss of soil moisture, much root damage and ultimately reduced yields, it should be done only late in the season after the plants are nearly mature. If it appears necessary to ridge earlier in order to take care of surface water on the heavier soils, the ridge should be broad or the furrow narrow. Another suggestion is that deeper planting will result in the tubers forming at a lower level with a consequent reduction in sunburn injury.

The Importance of Clovers in a Pasture.

The value of clovers as a constituent element of pastures is well recognised. They not only enhance the general fertility of the soil, improve its texture, and darken its colour, but in so doing they indirectly improve the growth of the grasses growing in association with them. This is particularly true in regard to those grasses which require a reasonably high standard of soil fertility—grasses that, in general, are the more valuable among our grazing plants. The clovers are, furthermore, richer in food materials than are the grasses; not only richer in proteins, but also in many essential minerals. The significance of these facts is the more apparent when the grasslands of Australia are considered in relation to mineral deficiency. Minerally-deficient pastures are characteristically devoid of pasture legumes, and it is interesting to note that when soil and other conditions become conducive to the growth of clovers, mineral deficiency quite often becomes corrected, at least in so far as evident symptoms in the health of stock are concerned. An adequate proportion of clover in any pasture must be regarded as being essential to the well-being of the grasses in that pasture as well as to the health of the live stock that browse upon it.

The foregoing is an extract from a report on the dairy pastures of Australia, by Mr. William Davies, of the Aberystwyth Plant Breeding Station, Wales, who recently spent a year in Australia carrying out pasture investigations.

Growing Green Peas on Trellises.

A New Method with many Advantages.

A. C. ORMAN, H.D.A., Agricultural Instructor.

On the coast, particularly in the Gosford and Dora Creek districts, the growing of green peas on trellises is a common practice, and is particularly suitable for small growers in these and similar districts.

The advantages claimed for this system are many. The yields are increased, picking is rendered easier, less disease is present on the haulms, the rows are more easily cultivated and kept free of weeds, and the plants are not affected so much by continued wet weather.

A Crop of Green Peas on Trellises.

The method of constructing the trellis is as follows:—Stout stakes 5 feet long are driven 6 inches into the ground at intervals of about 20 feet along the rows. As the peas grow, horizontal wires a little thicker than tie wire are alternately spaced on both sides of the stakes every 6 or 8 inches, or in pairs at the same distance, up to a height of 4 feet 6 inches, according to the growth of the vines. The wires are strained to stout short pegs at each end of the rows. The rows are usually spaced about 4 feet apart. Yields of up to 400 bushels per acre have been obtained by this method, according to reports.

A modification of the method, and one often employed by backyard vegetable growers, is to use sticks and bushes to support the plants.

What is Certified Potato Seed?

Why Individual Growers Cannot Have Their Seed Certified.

A. J. PINN, H.D.A., Special Agricultural Instructor.

What is meant by certified potato seed? Can I have my potatoes certified? These and similar questions are often received by the Department from potato growers, particularly those who have taken the trouble to select and otherwise build up a line of seed potatoes that is true to type and very free from virus and other diseases and pests.

Unfortunately there are many obstacles in the way of officially certifying seed on behalf of individual growers. For instance, an inspector may certify that a certain crop is up to the standard as regards freedom from

A Handy Potato Grading Table.

disease, etc., but it would be difficult to guarantee that all the seed bagged or offered for sale by that grower came from the crop previously inspected. On the other hand, with the aid and co-operation of properly constituted potato growers' associations, adequate check can be kept on these matters, and it is the knowledge of these safeguards which tends to build up confidence in the minds of buyers. It has to be remembered by those who have

good quality seed potatoes to dispose of that it is not sufficient for the grower himself to be convinced of the excellence of his own seed; he has to convince the buyer.

Thus we have the main reasons why individual growers cannot have their potato seed officially certified.

How to Form a Potato Growers' Association.

As the growing of seed, on a commercial scale at any rate, will be limited to certain potato-growing districts, growers anxious to have their seed certified are advised to solicit the co-operation of their fellow-growers in the formation of a local growers' association. Model rules for such a body are printed on the following pages. Incidentally, these rules also specify the various standards for different certified grades of potatoes.

MODEL CONSTITUTION OF A POTATO GROWERS' ASSOCIATION.

TITLE.

1. The name of the association is "The .... Potato Growers' Association.

HEADQUARTERS.

2. The headquarters of the association shall be at .... in the State of New South Wales.

OBJECTS.

3. The objects of the association shall be—

(*a*) To carry out the grading and labelling of the potatoes of members.

(*b*) To promote and further the interests of members in the production and marketing of potatoes.

(*c*) To sell or arrange for the sale, distribution, or marketing of the potatoes of members.

(*d*) To do all things necessary, incidental, or conducive to these objects.

(*e*) To construct, maintain, and alter any buildings or works necessary or convenient for the purposes of the association and its members.

(*f*) To employ or engage workmen, officers, etc.

POWERS.

4. (*a*) To carry out objects of the association.

(*b*) To suspend, disqualify, or otherwise deal with any member for failing to comply with any rule of the association, or doing any matter or thing which in the opinion of the association is contrary to its principles or objects.

CONTROL.

5. The control of the affairs of the association and the exercise of all its powers shall be vested in an executive consisting of seven of its members.

OFFICERS.

6. (*a*) The officers of the association shall consist of a President, Vice-presidents, Secretary, and Treasurer.

(*b*) All officers shall be elected at the annual general meeting and shall hold office until the end of the next annual general meeting or until the appointment of their successors.

(*c*) Should a vacancy occur in any office it shall be filled at the next meeting of the executive.

MEETINGS.

7. The annual general meeting of the association shall be held at .... in .... each year or on such other day as the executive shall determine. The executive shall meet at such times as are fixed by the secretary.

MEMBERSHIP.

8. The membership of the association shall be open to all bona fide potato growers who are financial members of the Farmers and Settlers' Association, Primary Producers' Union, or Agricultural Bureau, and who have an area of not less than 3 acres planted to potatoes at the date of application for membership.

SUBSCRIPTION.

9. The annual subscription payable by each member shall be as fixed by the association at each annual general meeting, and shall be paid not later than ....in each year.

GRADING AND INSPECTION OF POTATOES.

10. (*a*) Each member of the association, unless exempted by it, shall submit the potatoes grown by him for the inspection of an inspector appointed by the association.

(*b*) Before the inspection of the potatoes intended for seed of any member, the association may require such member to furnish a statutory declaration to the effect that the potatoes to be inspected are a part of the crop which has been inspected by an officer of the Department of Agriculture of New South Wales and certified by him to be "certified" or "standard" seed.

(*c*) After the inspection of the potatoes of any member, the inspector may affix to the bag or bags containing same a label in one of the prescribed forms. Such label shall only be affixed if the potatoes conform to the requirements set forth in Rule 11.

(*d*) There shall be payable by a member, the inspection fee fixed by the association in respect of every bag of potatoes inspected for him.

(*e*) Each member shall, on or before the thirty-first day of December in each year, furnish to the secretary of the association particulars of the area and variety of potatoes which the member intends to submit for the inspection of the Department of Agriculture of New South Wales for the purpose of seed certification.

LABELLING OF POTATOES.

11. (*a*) *Table Potatoes.*—A label will not be affixed by the association's inspector to any potatoes intended for table use unless they comply with the provisions of the grading regulations for potatoes made under the Plant Diseases Act, 1924, of New South Wales. When the inspector is satisfied that the potatoes comply with the above requirements he shall affix to the bags containing same a label in the form prescribed hereunder.

..........................POTATO GROWER'S ASSOCIATION

OFFICIAL LABEL

GRADED TABLE POTATOES

Variety ....

Size ....

Grown by .... of ....

It is hereby certified that the potatoes contained in this bag have been inspected by the association's inspector and are hereby guaranteed to be* .... grade.

Dated this .... day of .... 193 .

..................Inspector.

* Here write either No. 1, No. 2, New Potato or Chat.

(*b*) *Seed Potatoes.*—A label will not be affixed by the association's inspector to any seed potatoes unless—

(i) They comply with the provisions of the grading regulations for potatoes made under the Plant Diseases Act, 1924, of New South Wales, and
(ii) they are free from deep pits and not affected with surface scab over more than one-sixteenth of the surface area of the potato, which in no case shall affect the eyes of the potato;
(iii) the eyes of the potatoes have not grown out from the main tuber;
(iv) they are of even shape and are not less than 1½ oz. or more than 12 oz. in weight;
(v) they do not contain more than 2 per centum varietal impurities;
(vi) the crop from which the potatoes have been obtained has been inspected by an officer of the Department of Agriculture of New South Wales and certified by him to be "standard" or "certified" seed potatoes.

When the association's inspector is satisfied that the above-mentioned requirements have been complied with, he shall affix a label to the bags containing the potatoes.

"CERTIFIED" SEED LABEL (BLUE).

In the case of seed potatoes obtained from a crop which has been certified by an officer of the Department of Agriculture of New South Wales to be "certified" seed potatoes, the label shall be in the following form:—

........................POTATO GROWERS' ASSOCIATION

OFFICIAL LABEL

CERTIFIED SEED POTATOES

Variety..

Size ....

Grown by..

IT is hereby certified that the potatoes contained in this bag have been inspected by the Association's Inspector, and are guaranteed to be certified seed potatoes.

Date.. Inspector.

(Front of Label.)

The crop from which this seed has been obtained has been duly inspected by an officer of the Department of Agriculture of N.S.W., and meets with the prescribed standards relative to freedom from disease and varietal purity.

No liability as to the quality, condition, etc., of the contents of this bag will be recognised unless complaint be made in writing to the Secretary of the Association within three days of the original purchaser taking delivery of same.

(Back of Label.)

ALTERATION OF RULES.

The association may at any time make new rules and vary or delete existing rules.

"STANDARD" SEED LABEL (RED).

In the case of seed potatoes obtained from a crop which has been certified by an officer of the Department of Agriculture of New South Wales to be "standard" seed potatoes, the label shall be in the following form:—

..................................POTATO GROWERS' ASSOCIATION

OFFICIAL LABEL

STANDARD SEED POTATOES

Variety..

Size ....

Grown by...

IT is hereby certified that the potatoes contained in this bag have been inspected by the above Association's Inspector, and are hereby guaranteed to be standard seed potatoes.

Date.. Inspector.

(Front of Label.)

The crop from which this seed has been obtained has been duly inspected by an officer of the Department of Agriculture of N.S.W., and meets with the prescribed standards relative to freedom from disease and varietal purity, except that it does not attain the requisite freedom from virus infection to obtain a full certificate, but the crop was well grown, and well above average in health and vigour.

No liability as to the quality, condition, etc., of the contents of this bag will be recognised unless complaint be made in writing to the Secretary of the Association within three days of the original purchaser taking delivery of same.

(Back of Label.)

THE Department has a number of leaflets available on different aspects of vegetable growing—cultural, insect and pest control, and fertilising. The tities of these free leaflets are set out in the "List of Publications," copies of which are also available for the asking.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Fitzroy ... ... Manager, Experiment Farm, Grafton.
Funk's Yellow Dent ... J. A. L. Thompson, "Deep Water," South Gundagai.
Golden Beauty ... ... W. R. Mitchell, Lower Towamba, via Eden.
Ulmarra Whitecap ... J. Flanders, Ulmarra.
Wellingrove ... ... Manager, New England Experiment Farm, Glen Innes.

Sorghum—

Cowper ... ... Principal, Hawkesbury Agricultural College, Richmond.
Oxley ... ... Manager, New England Experiment Farm, Glen Innes.
Saccaline ... ... F. J. D. Doust, Lynn Farm, Camden.
White African ... ... Manager, Wollongbar Experiment Farm, Lismore.
Manager, Experiment Farm, Grafton.

Potato ("Certified" and "Standard" Seed)—

Carman ... ... Secretary, Potato Growers' Association, Millthorpe.
Early Carman ... ... Secretary, Potato Growers' Association, Millthorpe.
Early Manhattan ... Secretary, Potato Growers' Association, Millthorpe.
Secretary, Potato Section, Rural Co-operative Society Ltd., Orange (certified seed only).
Factor ... ... Secretary, Potato Growers' Association, Millthorpe.
Secretary, Potato Section, Rural Co-operative Society Ltd., Orange (certified seed only).
Secretary, Potato Growers' Association, Taralga.
Late Manhattan ... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.

Cucumber—

Early Fortune ... ... W. Parry, Terrigal.
Crystal Apple ... ... E. F. Ritter, Wyong.

Beans—

Tweed Wonder ... ... W. T. Sunderland, Bunglegumbie road, Dubbo.
E. S. Green, Whylandra Creek, Dubbo.
Superintendent, Riverina Welfare Farm, Yanco.

Tomato—

Improved Sunnybrook Earliana ... ... A. Sorby, Macquarie Fields.
Break-o'-Day ... ... A. Sorby, Macquarie Fields.
Manager, Experiment Farm, Bathurst.

Tomato—continued.

Bonny Best ...	... Manager, Experiment Farm, Bathurst. P. Morandini, "Riviera," Bunglegumbie-road, Dubbo.
Marglobe ... Norton	Manager, Experiment Farm, Bathurst.

Sweet Potato (rooted cuttings)—

Porto Rico ...	... S. Redgrove, "Sandhill," Branxton. Superintendent, Narara Viticultural Nursery, Gosford.
Nancy Hall ...	... S. Redgrove, "Sandhill," Branxton. Superintendent, Narara Viticultural Nursery, Gosford.
Southern Queen	... S. Redgrove, "Sandhill," Branxton. Superintendent, Narara Viticultural Nursery, Gosford.
Ashburn	... S. Redgrove, "Sandhill," Branxton. Superintendent, Narara Viticultural Nursery, Gostord.
Wannop	... S. Redgrove, "Sandhill," Branxton. Superintendent, Narara Viticultural Nursery, Gosford.
Pierson	... S. Redgrove, "Sandhill," Branxton. Superintendent, Narara Viticultural Nursery, Gosford.
Triumph	... Superintendent, Narara Viticultural Nursery, Gosford.
Yellow Strasburg	... Superintendent, Narara Viticultural Nursery, Gosford.
Vineless	... Superintendent, Narara Viticultural Nursery, Gosford.
Farmer's Special	... S. Redgrove, "Sandhill," Branxton.
Narrow Leaf Jersey	... S. Redgrove, "Sandhill," Branxton.

Asparagus—

Lady Washington	... Manager, Experiment Farm, Bathurst.

Melon—

Red Seeded Citron	... Principal, Hawkesbury Agricultural College, Richmond.

Squash—

Banana	... Principal, Hawkesbury Agricultural College, Richmond. C. J. Rowcliff, Old Dubbo road, Dubbo.

Watermelon—

Angelo	... C. J. Rowcliff, Old Dubbo road, Dubbo.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

A Poison Bait for Ants.

The following poison bait is recommended for the common black ant and the sugar ant:—

(*a*) Sugar, 4lb.; borax, 1oz.; water, 4 pints. Boil together for fifteen minutes and then allow to cool.

(*b*) Arsenite of soda (80 per cent. arsenious oxide), ½ oz. Dissolve in ½ pint of hot water and let cool.

Mix (a) and (b) and stir in 4oz. of honey.

Pour two or three fluid ounces of the bait into small tins (tobacco or cigarette tins will answer the purpose), and place in the tins small pieces of cloth as a "foothold" for the ants when feeding. Within five or six days the ants generally disappear, the bait having been conveyed to their nest.

As there is a trace of poison in this bait, keep it out of the reach of children and animals.

The Pumpkin Beetle.

Aulacophora hilaris Boisd.

W. L. MORGAN, B.Sc.Agr., Assistant Entomologist.

This article deals with the economic significance, distribution, and food plants of the pumpkin beetle, and describes the structure of the insect in the different stages of its life. A subsequent article will give data on its development and habits, and discuss measures for the control of the pest.

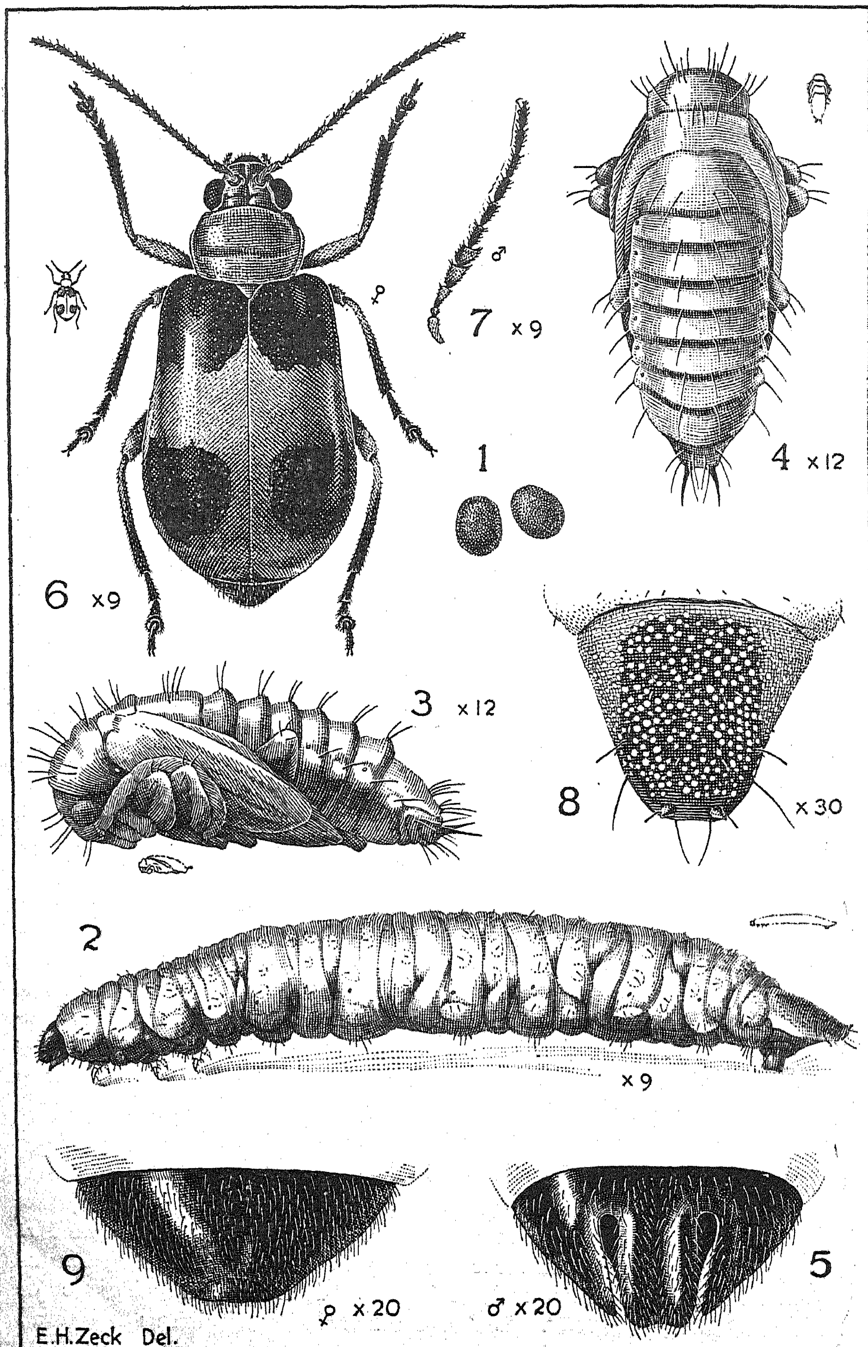
The pumpkin beetle (*Aulacophora hilaris* Boisd.) belongs to a family of leaf-eating bettles, the *Chrysomelidae,* many species of which are crop pests in various parts of the world. The adult, and not the larva of this species, is responsible for the damage done. It attacks the foliage and flowers of pumpkins, melons, squashes, and cucumbers. Twelve species[9] of *Aulacophora* are known to occur in Australia, and whilst several of them attack cucurbits in Northern Australia, *Aulacophora hilaris* is the species of pest importance in New South Wales.

Economic Status.

The losses due to this pest vary from a slight reduction of the crops up to such heavy or total destruction of the plants as to necessitate complete re-sowing. In northern inland portions of the State considerable losses occur each year, particularly in early crops, but every few years a general outbreak occurs, and most of the young spring crops throughout the State are heavily damaged or destroyed. At such times absence of rain may prevent re-sowing, or the re-sown crop may be equally badly damaged. Apart from the severe damage to young crops, older plants may be seriously thinned out or checked in growth. In addition, the beetles are particularly fond of the flowers and young fruit of pumpkins and squashes, and by continually destroying these may cause further losses. Occaionally, where the pest has been very abundant and dry conditions have prevailed, cherries, and even figs, have been attacked, and localised losses have resulted.

Previous Records of the Beetle.

As some doubt existed as to the identity of the species prevalent in New South Wales, specimens were submitted for identification to the late Mr. A. M. Lea, Entomologist, Adelaide Museum, and were identified by him as *Aulocophora hilaris,* Boisduval, originally described in "Voyage de l'Astrolabe," 1832, page 555[12]. Lea[9] states that the description by Boisduval, though short, applies exactly only to the species subsequently named *A. olivieri* by Baly,[10] and *A. australis* by Blackburn.[11]



The Pumpkin Beetle (*Aulacophora hilaris* Boisd.).

childr 1. Egg (X14). 2. Fully grown larva. 3. Pupa, lateral view. 4. Pupa, dorsal view. [5. Last a]bdominal segment of male, ventral view. 6. Female, dorsal view. 7. Male antenna. [8. Anal shi]eld of larva, dorsal view. 9. Last abdominal segment of female, ventral view.

The earliest published record of *Aulacophora hilaris* occurring as a pest is by A. S. Olliff[1a], who recorded it in 1892 on cucurbits and potato tops. The adult is first figured in this article, and the name "banded pumpkin beetle" is used. W. W. Froggatt[2a] in 1909 briefly described the eggs and newly-hatched larvae, and an accompanying coloured plate figured the adult, the eggs, and the damage caused to pumpkin leaves and cherries. In 1910 Froggatt[2b] described the fully developed larva and the pupa from specimens collected by Gallard from the roots of pumpkin plants at Gosford. Jarvis[5] in 1913 developed the beetle in the laboratory on the roots of marrow, by placing the eggs in moist sand at the roots of the plants. Jarvis figured and described the egg, larva, pupa, and adult. He considered that normally the pumpkin beetle develops on roots of herbaceous plants, and that with ordinary clean cultivation cucurbitaceous roots seldom suffer attack.

Its Distribution.

This species is widely distributed throughout Australia, having been recorded from Queensland,[5] Northern Territory,[6] South Australia,[4] and Victoria,[7] and apparently is regarded in each instance as the major pest of cucurbits. It has been recorded from most districts in New South Wales, but causes greatest losses in the North-west Slopes and Liverpool Plains districts and parts of the North Coast, being more prevalent in northern than in southern areas. It is least numerous in the colder and more elevated regions.

Food Plants.

In addition to all cultivated cucurbits, the pumpkin beetle has been recorded on potato tops (slight damage) and on the leaves and buds of sugar-cane by Olliff[1]; on the False Nightshade (*Solanum nigrum*) and the common dock (*Rumex* sp.) by Fuller[2]; on cherries and stalks of young apples by Froggatt[2b]; on young peach trees by Jarvis[5]; on the leaves and silks of maize by Gurney[8]; and on peaches and nectarines by French.[7]

The following hosts were noted in reports received by the Entomological Branch from growers in 1927-28, when the pumpkin beetle was unusually abundant:—Fig (the ripening fruit), grape, and the blossoms and young pods of beans. Additional host records by the author are lucerne (*Medicago sativa*), very slight damage; the blossoms of eucalypts and variegated thistle (*Carduus marianus*) very commonly, the beetles apparently feeding on the nectar or the pollen, as the blossoms were injured; prickly-pear (*Opuntia* sp.) blossoms, slight damage to petals; and the Paddy Melon (*Cucumis myriocarpus*), a cucurbitaceous plant which appears to be the favourite weed host.

The Nature of the Damage.

The damage to pumpkins, melons, and squashes commences as soon as the plants show through the ground, and although plants of all sizes are attacked, the chief damage is caused during the first three or four weeks of growth. A very young plant, with only the fleshy seedling leaves showing, may be destroyed by half a dozen bettles in the course of a few hours. The

large plant, however, is only seriously damaged or destroyed when many hundreds of beetles attack it, for the reason that the well-grown plant produces large leaves in rapid succession, and thus is able to outgrow the infestation. Usually, once the plant commences to make runners, it is able to withstand further attack.

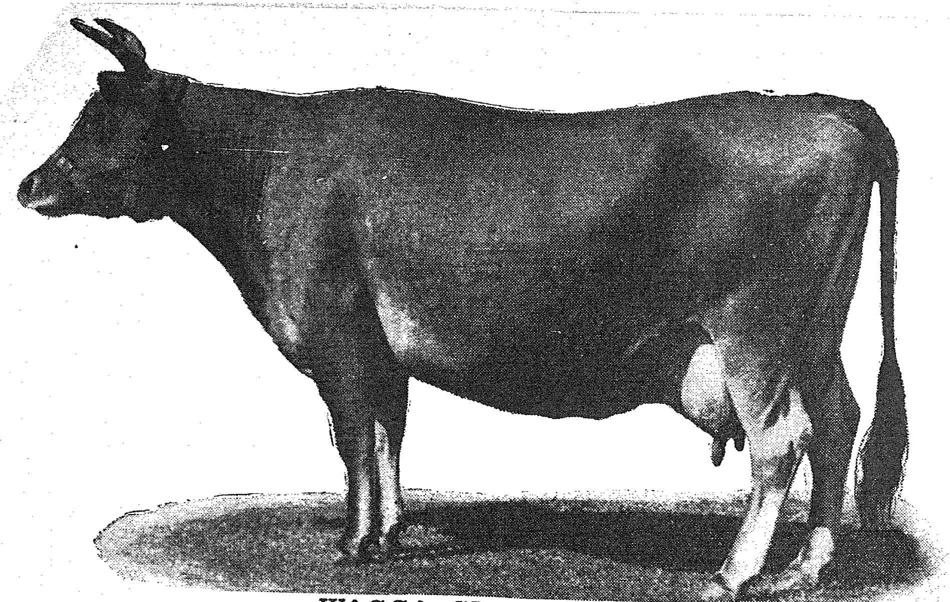
The beetles feed on the under-surface of the fleshy seedling leaves. The true leaves, while they are young and tender, are attacked from both surfaces; but when they become coarse and older the beetles are at first prevented from feeding on the lower leaf surface by the bristles that occur there; the attack, therefore, usually commences on the upper leaf surface, frequently at the periphery. After a certain amount of damage to the upper surface has occurred, the leaf wilts, and the bristles are negotiated more easily.

On the few occasions where pumpkin bettles have spread to cherries, they fed on the flesh of the ripening fruit, destroying its market value.

Descriptions of the Various Stages.

The Egg.—The egg (see 1 in the accompanying illustration) is .02 to .03 inches in diameter; at oviposition it is bright orange in colour, later becoming paler, sometimes almost white, but turning yellowish-brown just before hatching. The shell is very delicately reticulated, and in the freshly-laid egg is soft and pliable, so that the egg often becomes distorted in shape. The shell, however, soon hardens, becoming fragile and brittle. The eggs are laid singly or in groups; laid singly in damp soil they are irregularly spherical in shape; in groups they tend towards the polyhedral, while on hard, flat surfaces they are considerably flattened.

The Larva.—The newly-hatched larva (.05 inches by .012 inches) is slender and light-brown in color. The thoracic region is slightly wider than the head and abdomen, but the body is of general uniform width. The fully-grown larva (see 2 in the illustration) is .4 to .5 inches by .1 to .17 inches, yellowish white to pale yellowish brown, and the head and the thorax are slightly narrower than the abdominal region. The larval head is brown, length and breadth about equal, and antennae three-jointed. The dorsal surface of the prothorax is shaded with brown—more prominently in the newly-hatched larva. The legs are small, yellowish-brown, lightly bristled, with the tarsus in the form of a pad which bears a single claw. The abdomen is eight-segmented, the terminal segment bearing an anal shield dorsally, and ventrally a palp or "propleg" which is used in walking. The anal shield (see 8 in the illustration) is brown, with numerous circular white pittings that resemble a grating. The shield bears four large pairs of setae, the first and third pairs being clubbed, and the second and fourth aciculate. Dorso-anteriorly to the third pair of bristles there is a pair of small papillae; spiracles occur laterally on the second thoracic segment, and on each abdominal segment.



WAGGA GLADYS (7778).

The following are the Herd-testing Records of some of the Cows in Departmental Herds:—

Jersey Cow: WAGGA GLADYS (7778). This cow holds a world's record for butter production for the Jersey breed—22,847 lb. milk, 1,517 lb. commercial butter in 365 days. Awarded Champion Ribbon, Peter's Prize, R. A. Show, 1928. *Guernsey Cow:* WOLLONGBAR PARSON'S RED ROSE 20th (730). Holds a world's record for butter production for the Guernsey breed—17,252.5 lb. milk, 1,302.62 lb. commercial butter in 365 days. *Ayrshire Cow:* MISS DOT OF GLEN INNES (3760)—19,562.5 lb. milk, 1,088.64 lb. commercial butter in 365 days.

The Department has for sale young bulls from tested dams of the following breeds:—

MILKING SHORTHORN - JERSEY - GUERNSEY - AYRSHIRE

For further particulars apply to—The UNDER SECRETARY, Department of Agriculture, SYDNEY.

The Pupa.—The pupa (see 3 and 4 in the illustration) is .2 to .3 inches long, and about .14 inches broad. The large pronotum is deflexed anteriorly, and the head is bent back to lie beneath the first and second thoracic segment. Setae occur uniformly over the body, and the developing appendages (legs and antennae) are folded beneath the body as in other *Chrysomelidae.* The pupa is at first creamy white; the eyes soon darken, then the head, thorax, and abdomen, and finally the appendages.

The Adult.—The adult (see 6 in the illustration) is elongate in form, broader posteriorly than anteriorly; the female (.13 to .15 inches by .28 to .32 inches) is slightly larger than the male (.11 to .12 inches by .22 to .24 inches). The colour is bright orange with black markings. Each wing cover is marked with two prominent black patches, and in addition is slightly tipped with black. The terminal segment of the abdomen is black; the second last segment is black also, except for a small yellow band dorsally at each lateral margin. The eyes, the lower portion (tibia and tarsus) of each leg, and the ventral surface of each thoracic segment are black. The antennae are brown, except for the five basal segments in the male and the two basal segments in the female, which are yellow. Antennae, 11-segmented; simple in the female, but in the male (see 7 in the illustration) the third to fifth basal segments are wide and produced on each side. The abdomen bears five visible segments. In the female (see 9) the ventral surface of the terminal abdominal segment is plain, but in the male (see 5) it is deeply notched on either side, with a wide furrow extending longitudinally between the notches to the anterior margin of the segment.

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Unproductiveness in Ohanez Vines.

The Result of Forcing the Spring Growth.

H. L. MANUEL, Viticultural Expert, and N. D. LACKIE, Superintendent, Griffith Viticultural Nursery.

The decrease in the yields from Ohanez grape vines on the Murrumbidgee Irrigation Area during recent years has been investigated by the Viticultural Branch of the Department.

As the result it is now apparent that such practices as the application of water or nitrogenous fertilisers during October and November, with consequent stimulation of the vegetative growth of the vines during the spring months, have been responsible for the reduction in production.

The article which follows details the experiments carried out during 1932-33.

Growers of Ohanez vines throughout the Murrumbidgee Irrigation Area have been greatly perturbed, and at a loss to understand the continued decrease in yields which has occurred during recent years. In general, satisfactory crops were obtained until the vines were about eight years old, but from then onwards the yields have decreased each year. The vines do not now produce more than one-third the number of bunches they can reasonably be expected to carry through to maturity, and shedding during the blossoming period further reduces the ultimate yield.

For some time past the Viticultural Branch has been following certain lines of investigation, and it is now apparent that the forcing of the growth during the spring months by frequent or heavy irrigations, not only accentuates shedding during the blossoming period and is directly responsible for increased losses later in the season through berry wilt, but more important still, it adversely affects the differentiation of fruit buds for the following season. October and early November irrigations are disastrous to Ohanez, for it is during this period in the seasonal growth of the vines that the bunches which appear the following spring are formed within the dormant buds. Rain during October or November, the application of water or nitrogenous fertilisers, or any treatment tending unduly to stimulate the vegetative growth is reflected in an increased number of unfruitful buds the following year.

The Trials in 1932-33.

Experiments were again conducted in 1932-33, and for purposes of comparison an Ohanez plot was selected in one of the most vigorous vineyards (Farm No. 1848) on the Area, where spring irrigating has been practised, and another in a vineyard that has never been watered before December (Farm No. 218). A glance at the accompanying table should convince the most sceptical that "A vine produces fruit in inverse ratio to its strength, *i.e.*, a weak vine tends to produce more berries, and an excessively vigorous vine produces less fruit, than it can reasonably carry."

On Farm No. 1848 the soil is good, cultural operations have been thorough, fertilisers have been heavily applied, and it is recognised as one of the outstanding vineyards on the Area. On the other hand, the Ohanez block on Farm No. 218 was selected as a lightly-watered block, and the vines, on Riparia Gloire de Montpellier and Berlandieri X Riparia 333 phylloxera-resistant stocks, as representing a fair average of growth and crop; the soil is not above the average, cultural operations were good, fertilisers have never been applied and the vines were under-irrigated. It might here be mentioned that Riparia Gloire de Montpellier is a poor stock for Ohanez and Berlandieri X Riparia 333 reasonably good.

TABLE showing comparative production of (1) Spring-irrigated Vines; and (2) Vines not irrigated until December.

Farm No. 1848. (Spring-irrigated.)					Farm No. 218. (Not irrigated until December.)				
Irrigations.									
2 November ...				... 2·85 inches.	25 December ...				... 1·00 inches.
13 December ...				... 2·19 ,,	27 January ...				... ·75 ,,
9 January ...				... 3·76 ,,	13 February ...				... ·75 ,,
19 February ...				... ·77 ,,	12 March ...				... 1·00 ,,
27 March ...				... ·83 ,,					
11 April ...				... 1·44 ,,					
27 April ...				... ·73 ,,					
Total ...				... 12·56 ,,	Total ...				... 3·50 ,,
Average number of fruit rods per vine.									
		10					5		
Total length of fruit rods per vine.									
		33 feet.					12 ft. 6 in.		
Number of bunches per vine.									
		49					56		
Weight of fruit per vine.									
		35 lb.					43 lb.		
Number of bunches per 100 shoots.									
		43					112		
Weight of fruit per acre.									
1st Grade. lb.		2nd Grade. lb.		Waste. lb.	1st Grade. lb.		2nd Grade. lb.		Waste. lb.
10,450		1,650		3,410	12,100		4,730		2,310
	Tons.	cwt.	qr.	lb.		Tons.	cwt.	qr.	lb.
Total ...	6	18	2	4	Total ...	8	10	3	16
Weight of prunings per acre.									
	Tons	cwt.	qr.	lb.		Tons	cwt.	qr.	lb.
	2	3	0	24		—	15	2	24

The large amount of waste in the crop on Farm No. 1848 was caused mainly by berry wilt. The discolouration which appears on one side of the berry during hot periods and is known as berry wilt or sun scald, is caused through the inability of the root system to supply sufficient moisture to the excessive top growth during such periods of extreme heat, with the result

that the berries suffer. This trouble can be almost entirely eliminated if water is not applied during the months of September, October and November, although substantial rains would have the same adverse effects as irrigations. However, rain of this nature is the exception rather than the rule.

The large quantity of second-grade fruit on Block 218 was small fruit as the result of insufficient irrigations, and most of the waste was also similar fruit, there being practically no scalded berries.

If normal winter rains are experienced and good cultivation is practised, the vines should carry through until the end of November without irrigation, but in the absence of satisfactory winter rain, the vines should be irrigated in July or August to promote a good bud burst, and a second irrigation should not be necessary before December. The point may be raised that the withholding of water until late November or early December will result in undersized fruit, but this is not so, for there is ample time for the berries to fill out to normal size.

Pruning to lateral rods increases the crop, but unduly small laterals tend to produce light bunches that ripen rather later than the fruit on the main canes. The fruiting rods for next season should be tipped when 8 or 9 inches long to produce strong lateral growth from near the base of the canes, but where suggestions with regard to the timing of irrigations have been adopted there will be no necessity to prune the laterals to produce a satisfactory crop.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1932 budding season, trees from which should be available for planting during the 1933 planting season:—

Nurseryman.	Oranges.		Eureka. Lemon.	Marsh. Grape-fruit.	Total.
	Washington Navel.	Valencia.			
L. P. Rosen and Son, Carlingford...	4,000	4,000	1,000	1,000	10,000
T. Adamson, Ermington	1,500	1,500	500	250	3,750
A. T. Eyles, Rydalmere	2,000	1,000	...	...	3,000
H. J. Ferguson, Wyong	...	200	...	...	200

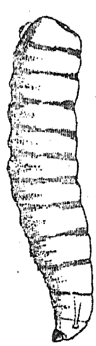
—C. G. SAVAGE, Director of Fruit Culture.

Fruit Flies.

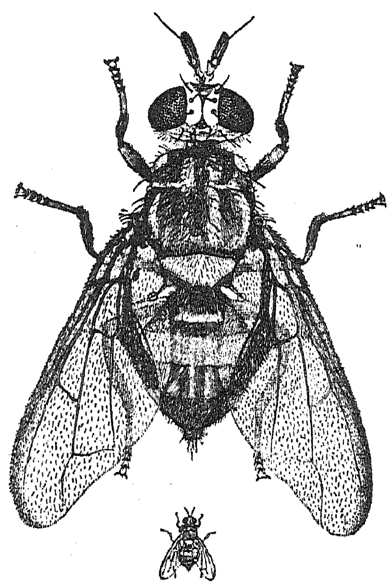
THE LAW COMPELS YOU TO CONTROL THEM.

A determined effort is to be made this season to lesson the toll exacted by fruit-flies. To this end, the Department and the New South Wales Fruit-growers' Federation are combining in an effort to gain the wholehearted support of not only growers, but also urban dwellers who may have only a few trees, but which may be a breeding ground for as many fruit-flies as the most neglected commercial orchard. Coloured posters depicting the methods of control will be displayed on railway stations, in schools and elsewhere, while leaflets describing in detail the control measures will be distributed freely. Being also assured of the co-operation of the press, the campaign of enlightenment on fruit-fly control measures should prove much more effective than merely relying upon a rigid enforcement of the provisions of the Fruit Diseases Act, which imposes severe penalties for neglect to carry out the prescribed control measures.

Two species of fruit-fly, viz., the Mediterranean fruit-fly (*Ceratitis capitata*) and the Queensland fruit-fly (*Chaetodacus tryoni*), attack fruit in certain parts of New South Wales, chiefly the coastal districts. They infest citrus fruits to a very limited extent, but may become serious pests of late varieties of stone and pome fruits in the central and north coastal districts.



Fruit-fly Maggot.



The Queensland Fruit-fly.

The adult flies are two-winged and about the size of a house fly. The wings of the Mediterranean fruit-fly are mottled, while those of the Queensland fruit-fly are clear.

Life History.

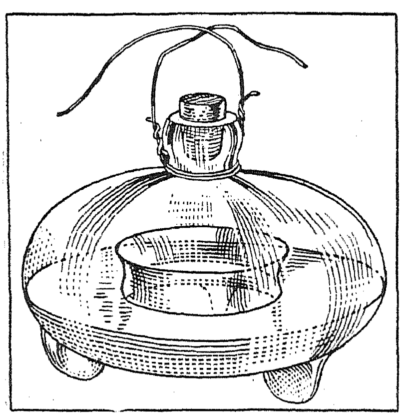
The eggs are minute, elongate and white, and hatch in a few days. The maggots are white to creamy-white in colour, have small black hook-like jaws, and feed for about two weeks (in summer) until fully grown, when they crawl from the infested fruit into the ground and pupate at a depth of 2 or 3 inches.

The adult fly, which emerges about fourteen days later, forces its way up through the soil to the surface. The adult insect then flies off and the female, after feeding, oviposits her eggs in or under the skin of the fruit. The time occupied in development from egg to adult in summer is about four or five weeks, but this period may be prolonged in cold weather.

Control Methods.

Destruction of Infested Fruit.—The control methods, set out in detail in the proclamation printed on the next page, comprise collection and destruction of all infected and waste fruit, combined with either spraying the trees with a foliage poison spray or trapping the flies.

Foliage Poison Spray.—While apple and pear syrup is recommended in the foliage poison spray, peach, plum or citrus syrup may be used, although the last-mentioned is less attractive to the Queensland fruit-fly. Apply the spray to two or more patches of the foliage rather than to the whole tree. A pump or syringe may be used, or the spray may even be splashed on with a large whitewash brush. Avoid spraying the fruit as far as possible.



Glass Fruit-fly Trap.

Trapping.—For trapping use an ordinary glass fly-trap, as illustrated. Bait the trap as prescribed and hang it in the tree about 6 feet from the ground, where it will be sheltered by the foliage. The greater the number of traps used, the better will be the results. Commence trapping on the earliest varieties and then in the sequence in which the varieties ripen. In making up the prescribed vanilla and ammonia bait note that a teaspoonful equals one-eighth of a fluid ounce and a tablespoonful one-half of a fluid ounce.

Proclamation Under the Plant Diseases Act.

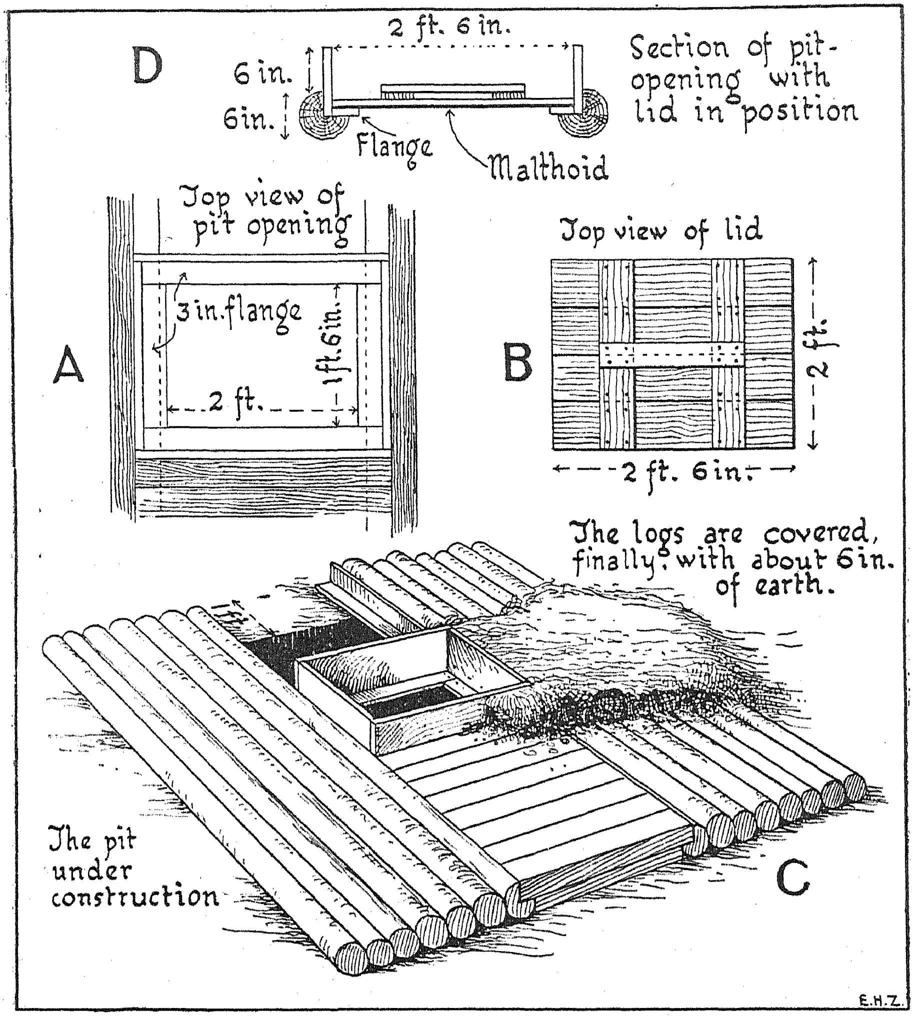
1. Every owner or occupier of land or premises throughout the State shall—

(*a*) at least once in every period of three days collect all fallen fruit;

(*b*) forthwith boil or burn all infected and all waste fruit or place such fruit in a pit covered in such a manner as to prevent the escape from the pit of any fruit-fly;

(*c*) not later than the first day of July in each year remove from the trees all seville oranges belonging to the intermediate crop, and not later than the thirtieth day of September in each year remove from the trees all mandarins and all seville oranges belonging to the main crop;

(*d*) not later than the thirtieth day of September in each year remove from the trees all loquats.



One Type of Insect-proof Cover for Waste Fruit Pit.

Provided that the Minister for Agriculture may exempt any owner or occupier from compliance with the provisions of this paragraph in respect of any crop or portion of a crop for such period and subject to such conditions as the Minister may specify.

2. Every owner and occupier of land or premises within the portions of the State described in the Schedule hereto shall—

(*a*) at least once in every period of seven days for a period of at least five weeks immediately preceding the harvesting or ripening, whichever is the earlier, of any pome, stone, loquat, guava or persimmon fruits apply to the foliage of each pome, stone, loquat, guava and persimmon tree at least ten fluid ounces of a foliage poison spray made according to the formula set forth hereunder or such other spray as may be approved by the Minister for Agriculture; or

(*b*) for a period of at least five weeks immediately preceding the harvesting or ripening, whichever is the earlier, of any pome, stone, loquat, guava or persimmon fruits attach to one tree in every ten or less number of each variety of pome, stone, loquat, guava or persimmon tree a fruit-fly trap made according to the specification hereunder described. Each trap shall be baited with at least six fluid ounces of freshly-made lure and shall be kept so baited during the period abovementioned. The lure to be used shall be—

(i) a fruit syrup made by boiling five pounds of apples, pears or peaches in 1 gallon of water; or

(ii) a mixture of one-eighth fluid ounce of vanilla, one-half ounce of household ammonia and 26 fluid ounces of water; or

(iii) such other lure as may be approved by the Minister for Agriculture.

Formula for Spray.—One (1) gallon of fruit syrup made by boiling five (5) pounds of fruit in one (1) gallon of water, three (3) gallons of water, four (4) pounds of molasses or treacle, and five (5) ounces of arsenate of lead powder.

Specification of Trap.—The trap shall be a spherical glass bowl aproximately seven inches in diameter and four and one-half inches in height, having an opening at the base to permit of the entry of the fruit-flies.

Schedule.—(1) The counties of Cumberland and Northumberland, parts of the counties of Camden, Cook and Hunter: Commencing on the east coast of the State of New South Wales at Gerringong Harbour; thence by a line north-westerly to the junction of the boundaries of the counties of Westmoreland, Cook and Camden; thence by a line north-easterly to a point 2 miles due west from the town of Emu; thence by a line north-westerly to a point 10 miles due west from the town of Bilpin; thence by a line north-easterly to a point on the western boundary of the county of Northumberland due west from Mount Yengo; thence by that boundary northerly to the northern boundary of the county of Northumberland; thence by that boundary easterly to the east coast of the State of New South Wales; thence by that coast southerly, to the point of commencement. (2) The municipalities of Grafton, South Grafton, Ulmarra and Maclean, and the shires of Copmanhurst, Nymboida, Orara and Harwood.

Citrus Red Scale.

Experiments with Liquefied Hydrocyanic Acid Gas Fumigation.

P. C. HELY, B.Sc.Agr., Assistant Entomologist.

Preliminary experiments were conducted at Leeton in March, 1933, and at Castlereagh, near Richmond, during April for the control of red scale (*Chrysomphalus aurantii* Mask.) by fumigation with liquefied hydrocyanic acid gas. This marks the first occasion on which liquid HCN was used in New South Wales. The material is now being manufactured in this State. It is a colourless liquid which quickly volatilises on exposure to the air, and in the experiments described hereunder it showed to advantage as compared with the standard calcium cyanide method of fumigation.

The Leeton Experiments.

These tests were performed on mature Valencia orange trees, heavily infested with red scale. The work was done at night with a practically constant temperature of 68 deg. Fahr. and a range of relative humidity of from 55 to 60 per cent., the surface soil beneath the trees being just moist. Ideal conditions, with no breeze, were encountered, and the sheets used were of good 10-ounce duck.

The apparatus for applying the liquid under the fumigation tent has not yet been standardised, and a different method was used in each experiment. At Leeton the liquid HCN was held in a metal can, and the dosage measured in centimetres in a graduated glass and blown under the fumigating tent at a pressure as a finely atomised mist. The liquid HCN dosage was calculated in cubic centimetres on an equivalent basis to the standard calcium cyanide dosage chart. Dosages 10 per cent. above and 10 per cent. below this rate were also tested, while a calcium cyanide compressed-block fumigant was employed on alternate trees for comparative purposes.

Results were estimated after an interval of two weeks by Mr. E. J. Wason, Assistant Entomologist, count being made of scales on fruits on many parts of the trees. The following table summarises the results and indicates a very satisfactory kill of scale in all tests. At a strength of 10 per cent. above and at the normal dosage the liquid HCN showed 100 per cent. mortality, whilst at 10 per cent. below standard the results were equivalent to those with the standard dosage of the calcium cyanide.

RESULTS of the Leeton Experiments.

Fumigant and Dosage.	Dosage.	Average percentage kill per tree.
Liquid HCN	Standard	100·00
Liquid HCN	Standard + 10 per cent. ...	100·00
Liquid HCN	Standard — 10 per cent. ...	99·81
Calcium cyanide	Standard chart	99·76
Average of controls (2)	....	0·0

The Castlereagh Experiments.

Valencia oranges were again used in these tests, but the trees were smaller than those used at Leeton. Heavy rain had recently fallen and the trees were showing new growth and the soil was very damp. The tests were similar to the Leeton ones, but with the addition of a plot treated at the rate of 20 per cent. below the standard calcium cyanide chart.

The method of using the liquid HCN was an improvement on the Leeton tests, greatly facilitating measurement of dosages. The apparatus consisted of a 3 lb. canister of liquid HCN connected by a pipe to a graduated glass cylinder capable of measuring up to 240 grammes of liquid. The canister was so arranged that a fresh one could easily be substituted. The glass cylinder was connected at the bottom to a discharge pipe fitted with an atomising nozzle, and at the top of the cylinder a small pump connection was fitted so as to allow a small brass pump to be attached. The whole apparatus was enclosed in a wooden box and was illuminated by a small electric bulb running on a battery and controlled by a small switch.

In measuring the dose necessary the liquid was allowed to run into the cylinder though a small cock until sufficient was shown on the gauge, when the cock was closed and a low pressure developed by a few strokes of the pump. The nozzle was then introduced beneath the tent, and the material atomised under pressure by releasing the control cock in the delivery tube.

Two types of cover over the trees were used in each plot,

All the work was done at night, the temperature range being from 62 deg. down to 51 deg. Fahr., and the corresponding humidity range from 41 to 79 per cent. relative humidity. In the first two "throws" particularly calm conditions were disturbed at occasional intervals by sharp gusts of wind of a few seconds' duration. The exposures in all instances were for forty minutes. No increase was made in the charge on account of temperatures, though the calcium cyanide chart recommends an increase of 25 per cent. for temperatures below 60 deg. Fahr. It is probable that owing to this the liquid HCN had an advantage over the calcium cyanide, as the liquid is more effective at the lower temperatures owing to reduction of diffusion rate and consequent reduction in leakage.

The actual estimating was done according to the method used at Leeton, counts of live and dead scales being made on as many fruits as possible on different parts of the trees. The natural mortality was calculated from

counts of live and dead scale on two control trees at the time of making the other estimations. From these two sets of figures the average net percentage kill was calculated and is summarised in the following table:—

RESULTS of the Castlereagh Experiments.

Fumigant.	Dosage.	Average net percentage kill.	Number of trees.
Calcium cyanide	Standard	99·56	8
Liquid HCN	Standard	99·85	8
,, ...	Standard + 10 per cent. ...	99·76	3
,, ...	Standard — 10 per cent. ...	99·75	4
,, ...	Standard — 20 per cent. ...	99·55	5
Average percentage mortality of controls.	....	1·385	2

The results show very little variation due to the different rates of dosage of liquid HCN, but the results from this material were slightly better than from the calcium cyanide at the standard rate.

Light-weight Tents Show to Advantage.

Two types of fumigating tents were used in each plot, one lot being of heavy calico and the other of closely-woven but lighter calico material.

An examination of the percentage kill on the trees under different covers shows a consistent, although very slight, advantage in favour of the lighter calico tents in all of the tests. This is particularly interesting when it is remembered that sudden sharp gusts of wind sprang up at intervals, and it suggests that the passage of a current of air through the heavier tents was possibly facilitated by the unduly rigid and tightly stretched tent walls. In the lighter tents the "caving in" on the windward side possibly tended to reduce this and to divert wind currents to some slight extent.

The following table illustrates the influence of the covers in different tests or "throws" during the experiment:—

TABLE showing Average Kill under Different Types of Cover.

Fumigant.	Light Calico.		Heavy Calico.		Details.
	Per cent. kill.	No. of trees.	Per cent. kill.	No. of trees.	
Calcium cyanide (standard)	100	3	99·65	2	Throw No. 1—Temperature, 62 deg. Fahr.; humidity, 41 per cent.
Liquid HCN (standard)	100	2	99·78	3	
Liquid HCN (standard + 10 per cent.)	...	...	99·76	...	Throw No. 2—Temperature, 59 deg. Fahr.; humidity, 48 per cent.
Liquid HCN (standard — 10 per cent.)	100	2	97·51	2	
Liquid HCN (standard)	99·76	3	...	...	
Liquid HCN (standard — 20 per cent.)	100	2	99·1	3	Throw No. 3—Temperature, 51 deg. Fahr.; humidity, 79 per cent.
Calcium Cyanide (standard)	100	1	98·6	2	
Percentage mortality in controls. Control A ...	2·3	1	...	...	....
Control B ...	0·47	1	...	...	....

STANDARD Dosage Chart (in grammes per tree) for Liquid HCN. (As used in the Castlereagh Experiments.)

NOTE: For calculation of dosages as used in the Leeton experiments multiply the dosage indicated below by 1·5 and read the resultant figure as cubic centimetres. Increases and decreases were calculated as percentage of these chart dosages.

Distance around the tree (in feet).

Distance over the tree (in feet).

	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	
6	5	5	5	5	5	5	5	10																										6
8	5	5	5	5	5	10	10	10																										8
10		10	10	10	10	10	10	15																										10
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Bees and Fruit Production.

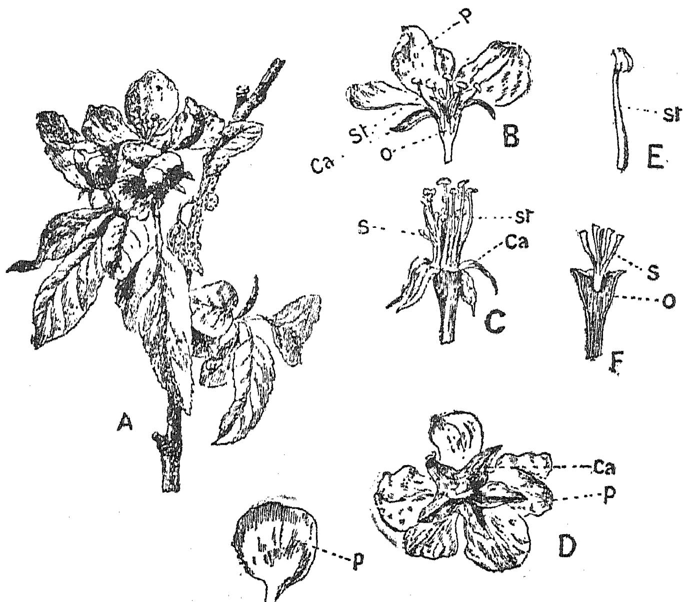
One Expert Recommends Three Colonies to Every Acre.*

Heavy losses are sustained annually by fruit-growers as a result of their trees not bearing well, which in many cases is due to defective pollination of the flowers of the trees. Investigations have shown that insects play an important role in the pollination of flowers, and in this regard there is none more industrious than the honey bee. If it were possible for human hands to do what the bee does, it is safe to predict that the owner of those hands would commercialise his ability and command a substantial wage. That the bee does it for nothing and is therefore neglected only goes to prove the old saying that what you get for nothing is often valued at cost price.

The Flower Structure.

An examination of the structure of a flower will at once reveal the meaning of the term pollination and the reason why insects are instrumental thereto:—

Many flowers consist, firstly, of the corolla with its coloured leaves, and under it the calyx with its small green leaves, and, secondly, of a number



The Parts of an Apple Flower.

A, Twig of apple; B, longitudinal section of flower; C, flower with corolla absent; D, view of flower from below; E, a single stamen; F, pistil with portion of calyx. (One-fourth natural size.) *Ca*, calyx; *p*, petal; *st*, stamens; *s*, style; *o*, ovary.

* E. M. Nyenhuis, Horticulturist for Northern Transvaal, in "Farming in South Africa."

of stamens arranged in a circle and terminating in knobs from which a fine powder (pollen) is given off, and of a thicker, centrally-placed, bottle-shaped excrescence or pistil, which is thicker at the base than at the tip. This distended part is the ovary containing the egg cells. The top end, called the stigma, is slightly distended or forked and viscous. Inside and at the bottom of the flower there are small glands which secrete the nectar, of which insects are inordinately fond.

Many flowers are complete in the sense that both the pollen and egg cells are produced by the one flower, *e.g.*, the peach blossom. Other flowers, again, are incomplete, *i.e.*, they produce either the pollen or the egg cells, but not both, *e.g.*, papaw flowers.

Some tree varieties, such as the walnut, produce both types of imperfect flower, while others, such as the papaw, produce them on separate trees.

Pollination Explained.

Nature has so planned it that two parts—the male and the female—have to unite before a new individual can be brought into being (for example, the seed in fruit). Our flowers demonstrate how necessary it is for the stigma to be covered by pollen to enable such merging to take place. This process is termed pollination.

The flower of a fruit tree is self-pollinated when the pollen of trees of the same variety is transmitted from one tree to another, while cross-pollination is the transmission of the pollen from one variety to another. The flowers of many fruit varieties are perfect, but have to be cross-pollinated before they can bear fruit. They are, therefore, self-sterile, as, for example, most almond and many apple, pear, and plum varieties.

Cross-pollination of most of our flowering plants is occasioned by insects and wind. Experiments with slides smeared with vaseline and exposed in an orchard have shown that very little pollen is transmitted by wind.

How Bees Play Their Part.

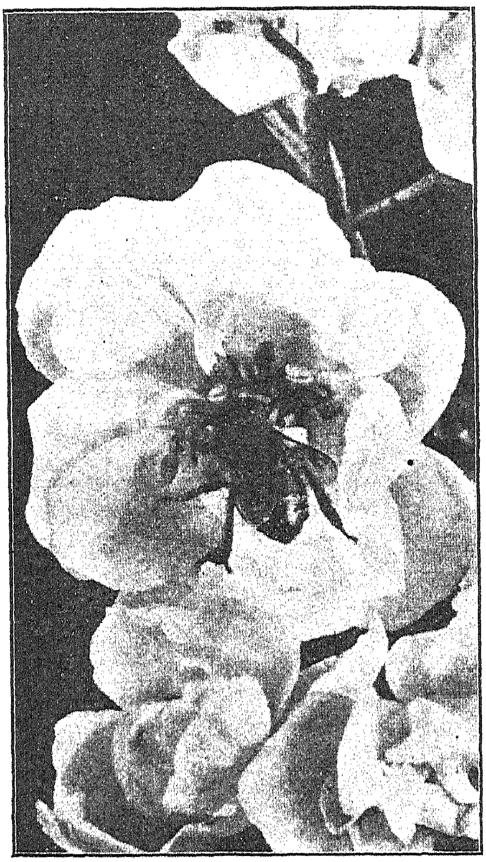
The reason why insects play such an important role in the pollination of flowers will be clear when the structure of the flower is considered. Inside the flower, nectar is secreted, and this attracts the insect, which, while crawling about within the flower in search of the nectar, accumulates pollen on its hairy body, and when it settles on another flower some of the pollen is bound to adhere to the sticky pistil of that flower.

Of all the insects that visit flowers the highest frequency belongs to bees, though there are other insects, such as the Syphrid flies, small beetles, etc., that assist in the transference of pollen from one flower to another. The bee is, however, the best equipped for this function. It has been shown that by placing a beehive in an orchard during the flowering season it is possible to enhance the fruit crop, even though the orchard may be in a fruit area famed for the production of good crops in normal seasons, and it has also been shown that the trees nearest to the hive bear the best crops.

The distance the pollen can be carried and the number of flights made by each bee will depend on weather conditions and the size of the swarm. On warm, sunny days the bees are more active than on cold or cloudy ones.

Three Colonies to Every Acre of Fruit Trees.

Experiments have shown that even with cold weather during the flowering season the trees nearest the hives bear better than those farther away. Thus, the greatest distance to which "suitable" pollen can be carried from its sources to the trees to be fertilised is determined by the unfavourable seasons. "Suitable" pollen is that which will produce good results after pollination. For example, the pollen of certain tree varieties will only be suitable for certain other varieties, *i.e.*, certain apple varieties for other apples, as is the case with pears, plums, strawberries, and almonds.



The Busy Bee at Work.

Therefore, in view of the above, it is recommended that bees be kept at the rate of one strong colony, or, where possible, two colonies to the morgen (about two-thirds of an acre). The hives should be moved about in the orchard during the flowering season, and removed thereafter.

Beekeeping should go hand in hand with fruit-growing to the furtherance of the prospects of greater profits.

"The Beginner in Bee Culture," by W. A. Goodacre, is a booklet on beekeeping that can be recommended both to the commercial apiarist and to the man with only a few hives. It is published by the Department, and is priced at 1s. 2d., posted. It has sold widely not only in New South Wales but also in the other States.

Orchard Notes.

November.

C. G. SAVAGE and H. BROADFOOT.

Picking and Packing Cherries.

During November the cherry-picking season will be in full swing. Many varieties of cherry are very delicate and very susceptible to injury, and the fruit must, therefore, be handled with care. The fruit should be harvested when at the firm, ripe stage, and when dry and cool. It should be picked with the stalk attached (since it then keeps better) and handled by the stalks. The bloom, on varieties which show any, should be retained, and varieties which bruise easily should be picked into shallow baskets holding about 10 lb.

A Picking Stool.
This stool is also useful for pruning.

It is found that kerosene tins cut in halves are suitable for cherry picking purposes. Some pickers prefer a side taken out, but in either case rough edges should be turned and well beaten down so that they will not injure the fruit when emptied from the tin. Whatever picking receptacle is used, it should be capable of being slung from the picker's shoulders or hooked to ladder or tree limb convenient to the picker, leaving both his hands free for picking. Many varieties of cherry trees have long, slender, flexible limbs which can be bent and held down readily under the picker's arm while he picks with both hands.

Use a Cherry-picking Stool.

Some form of scaffolding or of steps is necessary when picking cherries from large trees. To allow of quick shifting, steps should be as light as possible, and wide at the base to ensure stability. On a good cropping tree the fruit is crowded, so that the cherry picker is not changing his position as often as one picking larger fruits, and this being the case, a long platform stool is very convenient, for it allows the picker to work over quite a wide area of tree without shifting the stool. A stout plank of light timber

Agricultural High Schools

THE Department of Education wishes to call attention to the facilities provided by the Hurlstone and Yanco Agricultural High Schools.

Provision is made in each for a three-year course leading to the Intermediate Certificate Examination. A Leaving Certificate course is now included at both schools.

In addition to a training in the agricultural sciences, the pupils receive a sound general education, and special attention is paid to practical training in the field and on the farm.

Owing to the increasing number of applicants for admission, it is now found necessary to determine priority of admission by competition at the High School entrance examination, conducted in conjunction with the Primary Final examination.

The boarders pay £11 11s. 0d. per term for board, lodging and laundry (three terms a year). If in attendance the whole three terms the total charge will be 32 guineas. In allotting places for boarders, preference is given to eligible applicants from country districts.

The equipment generally is up-to-date, and is designed to show the latest developments in labour-saving devices.

HURLSTONE.

The Hurlstone Agricultural High School is situated at Glenfield, 24 miles from Sydney, in modern buildings amidst spacious fields and playing areas.

The school accommodates 180 boarders and about 150 day boys. Day boys may obtain free train passes to and from their homes.

A Leaving Certificate and Matriculation Course is provided at this school for pupils who wish to enter the Teachers' College for training as teachers of agricultural subjects or to enter the University.

YANCO.

The grounds of the Yanco Agricultural High School comprise an area of approximately 1,000 acres, and the buildings are surrounded by capacious lawns and gardens. The school accommodates 200 boarders.

A Fourth Year course leading to the Leaving Certificate Examination will be instituted from the opening term of 1934.

A feature of the course is the instruction given in wool-classing and the application of irrigation to farming.

G. R. THOMAS,
Director of Education.

supported by two trestles is convenient when picking heavily-laden, very large trees where much of the fruit is out of reach of a picker standing on an ordinary stool. Pickers should be careful not to break off fruit spurs, as this means loss in succeeding crops.

Some Points in Packing.

The 12-lb. case is in most favour with growers and buyers of cherries. In packing, stemless cherries should be rejected, and the first (top) layer of fruit should be arranged in rows with stems hidden. Women and girls are usually the most expert packers. Lay the cherries, stems uppermost, on the bottom of the box, fill the box, taking care the corners are well filled, nail on the bottom, and then turn the box over and mark the face side as "top," or stencil the cases so that the properly-faced side will be opened, showing the cherries neatly arranged and presenting a very attractive appearance. When competent packers are not available or the fruit is rather small or soft for row facing, as described above, attractive facing can be secured by picking up the cherries by the stalk, and placing them in position in bunches, stalks uppermost, and then filling up as already described. No matter how the facing is done, care should be taken that it is fairly representative of the fruit that fills the box.

The boxes should be lined, top, bottom and sides, with clean white paper so placed that it can be folded back to expose the cherries when the box is opened.

Cherry Tree Slug.

If this pest appears the tree should be sprayed with lead arsenate before the slugs become too numerous. However, should the pest appear on the trees a few days before the fruit is ready to pick, as it often does, the spraying of course must be delayed until after the fruit is harvested.

The After-Care of Buds and Grafts.

SOMETIMES buds and grafts take excellently, but defects in the after-care of the trees lead to the failure of the growth from the buds and grafts to develop satisfactorily. This will be obviated if methods of after-care indicated in the following notes are followed.

Budded Stock should be Cut to a Stub.

In the spring, when the natural buds of the stock begin to develop, the shoots that were budded during the previous growing period should be cut back to start the inserted buds into activity. This cut should, as a rule, be made between 2 and 3 inches above the inserted bud. By doing this a stub is left, to which the inserted bud can be tied as it develops. This protects the new shoots from being broken off by the wind, by birds resting upon them or by being broken off by persons or by horses brushing against them.

In early spring, buds on the stub above the inserted bud should be picked off by the thumbnail, for such buds, if allowed to grow, will in many cases

sap the growth from the inserted bud or graft. It is, however, worth remembering that the inserted bud seems to develop more vigorously and more healthily if the buds on the stub above are allowed to start. Later it is necessary to pinch back the growth of the normal buds to prevent the inserted buds from being sapped. The latter benefit by sap circulation and sap elaboration encouraged by the former. Once the inserted buds are established and have grown out a few inches, the stub growths can be brushed off.

Treatment of the Growth from Below the Bud or Graft.

Many growths will develop from the stock below the inserted buds and from below the grafts inserted earlier in the spring of the current season. On nursery stock it is advisable that these should be rubbed off as soon as they appear, but it is better to allow some of these growths to remain on established trees. Care should be taken to prevent these growths sapping the vitality of buds or grafts. Such shoots as show great vigour are better rubbed off at once, otherwise they may prove a constant menace. It is, as a rule, better to allow weaker shoots to remain, but those that show increased and marked vigour should be pinched or slashed back in the interests of the inserted buds or grafts.

There are three advantages in leaving some growths below the bud or graft on the stumps of the worked-over trees:—

(*a*) The foliage of these growths changes raw food material into organised food material. It is important to remember that by cutting back main limbs in connection with budding or grafting, the major part of the foliage is lost, and the roots thereby suffer deprivation of organised food material until sufficient growth occurs to restore the balance between root and top.

(*b*) The growth of branchlet and foliage on the stump protects the bark from the sun, and by promoting sap circulation militates against sun scald of the bark.

(*c*) The extra growth helps to protect tender new shoots from inserted buds and grafts from breakages by wind.

Sometimes when working over established trees some limbs are left unworked. In such cases it is frequently necessary to check their growth during the following growing season or they will too greatly sap growth from the buds and grafts.

Treatment of the Shoots from Buds and Grafts.

These should be interfered with as little as possible during the growing season, but when they make rapid growth it is necessary to pinch them back to prevent them being blown out by winds. In winter prunings they should be cut back severely to prevent too rapid extension, until fairly established.

It may be necessary to remove superfluous inserted buds, but this should not be done until those selected for forming the trees are well established and offer a reasonable prospect of withstanding strong winds and other

adversities. Their gradual removal may extend over a period of two or three years; during this period they should be more severely pruned than the selected growths, for which they are a useful reserve in case of loss among the latter. Similarly selected scions on a grafted stump should be retained until the callous has spread well over and all round the cut edge of the stump. On a thick stump there should be more than one scion. If there is only one, the opposite side will be ill-supplied with sap or will be sapless and devitalised. Scions round the stump preserve sap circulation and hasten the callousing of the wound. Though delay in cutting scions out often necessitates a fairly big wound when the operation is performed, such wounds are surrounded by a new callous and the liberal flow of sap encourages rapid healing.

On re-worked established trees there is often rapid growth from buds and grafts, and during the first few years (until the callous has crept well round) there is danger of the shoots being broken out. For this reason new limbs should be braced. Many of the stubs left from cutting back budded stocks will dry and die, but sometimes they linger and grow feebly. In either case they should be removed. This can be carried out most conveniently during the following pruning season, but delay until the following summer is better. For this work a sharp, fine, narrow-bladed pruning saw is often safer than secateurs.

Export of Apples and Pears to United Kingdom, 1933 Season.

THE numbers of cases of apples and packages of pears and plums exported to the United Kingdom from New South Wales during the 1933 export season, together with the percentages forwarded to the various ports, were as follow:—

Apples.

Port of Unloading.	Cases.	Percentage of United Kingdom Total.
London	207,022	69·32
Liverpool	61,133	20·47
Glasgow	17,203	5·57
Hull	13,313	4·45
Total, United Kingdom	298,671	......

Pears.

	Packages.	
London	26,660	66·02
Hull	13,723	33·98
Total, United Kingdom	40,389	......

In addition, 7,430 boxes of plums were exported to the United Kingdom, all of which were consigned to London.

London received 69.58 per cent. of the total shipments of apples, pears and plums forwarded to the United Kingdom.

Conditions Influencing Size in Fruit.

MR. W. W. COOKE, Senior Fruit Instructor, has supplied the following observations upon factors influencing size in fruit:—

As on former occasions when heavy crops of fruit occurred in most of the States in the same year, the prices received for fruit sold on the Sydney and other markets during the past season were often most unsatisfactory. Numerous cases have been recorded where the prices realised only paid marketing expenses, leaving the cost of growing, picking, packing, and cases to be borne by the orchardist. Some growers, however, state that, considering the glutted markets, the prices received for good lines of fruit have been satisfactory. These prices have varied considerably, and apples of the same variety and of similar quality excepting size, were sold during the same week for as low as 2s. per bushel, and as high as 9s.

Whilst an over-supply of fruit this season was largely responsible for the low prices received, other factors operated, among which may be mentioned the small size of much of the fruit, damage caused by black spot and hail, faults in grading and packing, and reduced purchasing power of the public. In many instances the fruit marketed was too small to sell for satisfactory prices during a year of abundant supplies. This want of size may be attributed to such causes as (*a*) trees carrying too heavy a crop of fruit, (*b*) dryness of the season, (*c*) damage to the leaves of the trees by disease and hail.

After a light crop of fruit, such as was harvested during the 1931-32 season, the tendency is for the trees to set a heavy crop the following season. Unless this is corrected by judicial pruning and also thinning out of fruit if necessary, small fruit will be produced. That the evils of a dry season can, to a large extent, be avoided by early ploughing and correct cultivation, was well illustrated this season in numerous orchards.

It has been proved that a certain number of healthy leaves to each fruit are necessary for the fruit to grow to a given size, and damage and destruction of the leaves by black spot or other causes must necessarily reduce the size of the fruit. Loss from black spot was more severe than usual last season in many districts. This may to some extent be attributed to less spraying than usual having been done the previous season, when crops failed through the attack by thrips.

Spray and Cultivate Thoroughly.

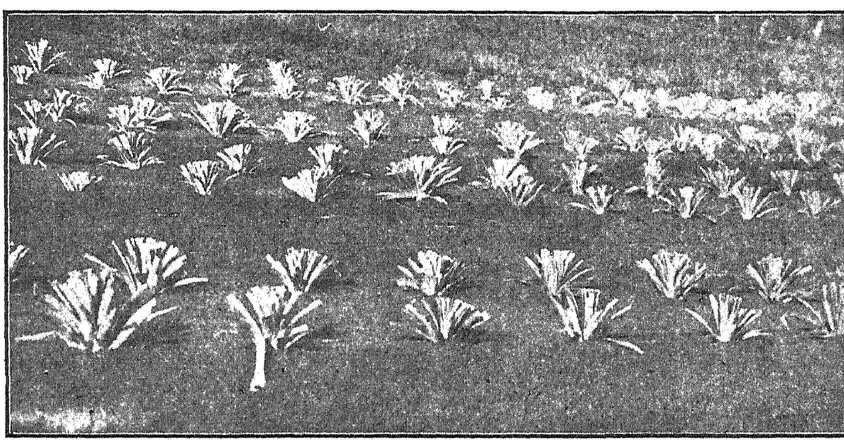
As in some orchards the crop of pome fruit will probably be light this season (1933-34), there is a danger that similar neglect may again occur, not only with spraying but with cultivation as well. If so, this is sure to act detrimentally, and both the trees and fruit will suffer the following season. As far as means will allow, it will be a sound policy to spray and cultivate orchards thoroughly, even though the setting of fruit may have been light, as this not only ensures good fruit this year, but will lay the foundations for clean fruit and healthy trees the year following. If necessary work is not neglected, and the trees are sprayed, cultivated, etc., even

though no fruit has set, the trees obtain the full benefit of the rest due to an off season, whereas if seasonal work is neglected, they are denied the advantages that should follow such rest. This was clearly illustrated during the 1931-32 season, when many orchards showed great improvement due to rest and attention.

Pineapple Varieties.

In last month's issue a reminder was given as to the best time and method of planting pineapples. The area sown to this fruit is increasing on the North Coast and new and prospective growers would be well advised to follow the cultural methods outlined in the leaflet issued free by the Department, whose address is Box 36A, G.P.O., Sydney.

Discussing the question of varieties the leaflet mentions that there are a good many varieties of pineapples, but, for commercial purposes, the most widely grown—being the best flavoured, the most hardy, and the best shippers—are Smooth-leaved Cayenne, Queen and Ripley Queen (or Ripley). In the north coast district, from Tweed Heads to Coff's Harbour, the Smooth-leaved Cayenne has proved the most satisfactory one to grow.



Pineapples just Planted Out under Double Row System.
Note how the plants in the double rows are "staggered," *i.e.*, the plants in one row are opposite the spaces in the other row.

Queen.—This variety is free-growing, compact, and handsome, coming quickly to maturity. The fruit is of an attractive deep-yellow colour, very juicy, flesh pale yellow, of exquisite flavour, and a good keeper. The crown is of medium size and the flowers lilac. Weight, 3 to 6 lb.

Smooth-leaved Cayenne.—Leaves long and smooth or with very few spines, broad, dark green; flowers, purple; fruit very large, crown large, pyramidal, dark orange-yellow; flesh, pale yellow, rich, highly flavoured; pips, large, flat. Does not sucker so freely as other varieties. Usually weighs 6 to 10 lb. Largely grown for market.

Ripley Queen (*or Ripley*).—This variety is not as consistent a bearer as the common Queen, having one main crop and several "off crops." It ripens earlier than Queen and has a better flavour. Flowers purple, pips prominent. The fruit is roundish ovate, slightly compresesd at either end and of a pale copper colour when ripe; flesh yellow, firm, rich, and very sweet. The crown is of medium size and takes about twenty-two weeks from flowering to maturity. Weight, 3 to 6 lb.

A Banana Recipe Booklet.

WHEN it is considered that the banana is an article of diet in every country of the world, and that the inhabitants of some portions of the globe subsist on it almost entirely, it is strange to find some people under the impression that bananas should be eaten sparingly and only by people with good digestion, runs the introduction to the banana recipe booklet issued by the Commonwealth Banana Committee.

It is true that the banana, eaten in an *unripe* state, will, in common with all fruits, cause intestinal disturbance to a greater or less degree. The *ripe banana,* however, is not only a fruit of remarkably high food value, but is amazingly easy to digest. It can be eaten with safety and relish by everyone from infancy onwards.

No fruit compares with the ripe banana in food values; no fruit approaches it in regard to digestibility and easy assimilation; no fruit and very few foodstuffs approach it in regard to value for money expended. Writing of the banana, Professor S. C. Prescott (Massachusetts Institute of Technology) says: "The ripe banana contains all the classes of food materials required for the human body. Although the amounts of protein and fat are slightly too low to constitute a perfectly balanced ration, the combination of bananas with milk, or its utilisation to supplement a diet containing a small amount of meat will produce a ration which is ample to take care of the body needs."

Copies of the booklet, "Banana Recipes," can be obtained free of charge from the Department, Box 36A, G.P.O., Sydney. It contains many more interesting facts concerning the food value of the banana and numerous well-tried recipes.

"An Orange a Day................................"

ACCORDING to reports of the autumn session of the Middlesex Hospitals Medical School the saying that an apple a day keeps the doctor away is due to be superseded by the saying—An orange a day keeps the doctor away.

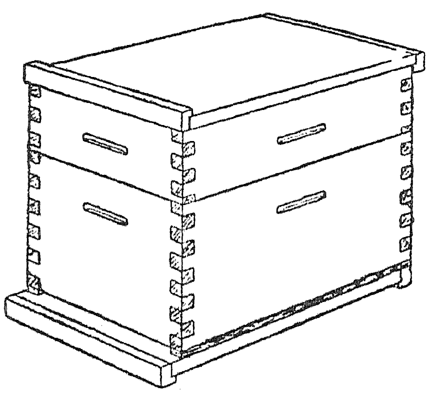
"The apple is a most delightful fruit," said Professor V. H. Mottram, Professor of Physiology of the University of London and an authority on foods, "yet it is only a sweetmeat and is negligible as nourishment or as a medicine. On the other hand, the orange is most valuable as nourishment, and medicinally. It is anti-scorbutic, and rich in the vitamin contained in sunlight. It also has calcium, which is essential to bone-building. Recent experiments indicate that oranges are nearly the equal of milk in nourishment."

Are Your Bees in Frame Hives?

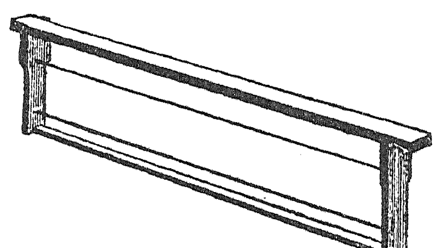
With the falling off in returns from their main sources of income, many farmers have turned their attention to sidelines, among which is numbered beekeeping. Judging from the number of inquiries that have reached us lately, it is patent that some of these newcomers into the industry have their bees in box hives, whereas the law provides a penalty of £20 for such an offence. The bees must be kept in frame hives. Below is described the method of transferring bees from box to frame hives.

Transfer the Bees during Warm Weather.

TRANSFERRING work should be carried out during warm weather and when a honey flow is on. First, prepare a standard-size hive body complete with frames, and standard-sized bottom board and cover. All the frames with the exception of one should be wired, and contain sheets (preferably full ones) of comb foundation. Give the bees in the box hive some smoke, remove the hive from its stand, and substitute for the time being the frame hive minus the one empty frame; this new hive on the old stand will keep the field bees occupied for a while. Next turn the box hive upside



A Langstroth Hive.



A Frame, Wired.

down, remove its bottom board, and place an empty box, open side down, over the combs; have a neat fit if possible. Drum the bees up into the empty box by beating on the sides of the box hive with two stout pieces of board. When completed remove the box now containing the bees and place it temporarily over the frames of the new hive on the old stand. The combs may now be removed from the box hive. The best pieces of worker brood comb should be cut to fit neatly in the empty frame, and made secure with string fastened right around the top and bottom bars.

Next lift up the box of bees from above the frame hive, and place the frame of brood about the centre of the frame hive; replace the cover on the frame hive, and then dump the bees from the box at the entrance of the new hive, and allow them to enter. It is usually best to dump a few first and see that eager entry is sought, and then bump the remainder out. The bees should make a contented start in their new home, having brood for inducement.

After the first box hive has been successfully transferred as mentioned and good headway made in brood rearing, other box hives may be transferred by what is known as the second method of transferring. Secure a frame of brood (preferably with some larvae), and place it in a new prepared hive fitted with comb foundation. Invert the box hive, place the frame hive minus its bottom board over the combs and then drum the bees up into the frame hive. When the drumming is completed, the new hive, now containing the bees, is placed on its bottom board on the old stand. Remove the cover of this new hive and place a queen excluder over the frames; then on top of the excluder fit the old hive to act as a super for the time being. In three weeks a good brood nest should be established in the frames, and all of the brood in the old box above will have emerged, the queen being unable to return to it. The box may now be removed and the bees drummed out of it into an empty box and then dumped in front of the new hive. The combs can be removed from the box hive and the honey and beeswax made use of. There is practically no loss with this method of transferring.

Summer School for Beekeepers to be held in January.

Arrangements are being made for the usual summer school in apiculture to be held at Hawkesbury Agricultural College, Richmond, from the 3rd to the 18th January, 1934. The course will be open to persons of either sex over the age of sixteen years, and the instruction will include practical work, lectures, and demonstrations, covering all the work necessary in apiaries.

The fee for the course will be £3 10s., including instruction as well as board and lodging. Students proceeding to the school by rail will be able to travel at concession rates where the distance each way to and from Richmond is not less than twenty-five miles. Students travelling by any of the North Coast Steam Navigation Co.'s steamers will also be entitled to a reduction in the fare.

The attendance at this course will be limited to twenty persons, and applications will be dealt with according to priority of receipt, subject to preference being given to those applicants who have not previously attended the summer school in apiculture.

Applications for admission to the course must be forwarded to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney, by not later than 19th December next. A prospectus containing full particulars of the course will shortly be obtainable from the Department.

The Flax Industry.

LITTLE PROSPECT OF SUCCESS IN AUSTRALIA.

Because of the large importations of linseed for the production of oil, as well as the possibilities of an export trade in fibre, the Department has for many years been conducting experiments in an attempt to establish as an industry the growing of linseed. Seeds of a large number of varieties from all parts of the world where linseed is produced have been imported and tested, experiments being conducted at various experiment farms and in co-operation with many farmers under various conditions of soil and climate, but the results generally have been disappointing.

Are Our Climatic Conditions Unsuitable?

IN an occasional favourable season satisfactory crops have been produced in New South Wales, and it is this exceptional success that tends to indicate that normally our conditions are unfavourable for the production of either linseed or flax. The probable reasons for the failure of linseed to thrive in this State are the irregularity of the rainfall and the short duration of the spring. The cereals wheat and oats are able to withstand dry spells which occur during their period of growth, but linseed appears to be checked by periods of scanty rainfall and by the high temperatures which are frequently experienced during the spring months.

Though the Department is continuing its experiments in an effort to discover means by which the crop can be produced profitably in this State, it does not at present encourage farmers to undertake the commercial cultivation of linseed.

That the experience in New South Wales has been similar to that in the other States of Australia is now evident from a report on the flax industry made available by the Development Branch of the Prime Minister's Department.

The following are extracts from this report, in which Australian experience has been assembled and comparison made between the cultural and processing methods and the economics of production in this country and those countries in which the industry has assumed larger proportions:—

Flax has been grown in small quantities in selected areas in Australia for upwards of thirty years, but it has been impossible during that period to establish a profitable export industry for the sale of fibre. The world's price of flax, expressed in gold currency, is at present close to the pre-war level, and little improvement, if any, can be expected, pending a solution of the present crisis. The development of a profitable export trade in fibre, therefore, would appear to be out of the question unless more economical methods can be devised for handling the crop and increasing the recovery of fibre per ton of retted straw treated.

Efforts that have been made in this direction are not encouraging. Revolutionary methods of treating the straw which would substantially decrease the cost of the fibre have been suggested, but, until manufacturers endorse the claim made in respect of the machines which have been invented by their willingness to utilise this particular fibre, it would be idle to pass any comment.

Linen goods are not manufactured in Australia, and the only local market available is that provided by the soft fibre requirements of the rope and cordage manufacturers, the limitations of which can best be appreciated from the fact that imports of Italian hemp have averaged only 383 tons for the last three years. On the basis of the results obtained in Gippsland during the past four years the production of 383 tons of flax fibre would necessitate the cultivation of approximately 4,000 acres of crop, but even this restricted area would probably exceed the present limit of economic expansion, for it must be remembered that Italian hemp, even if largely displaced by Australian flax, would still be a necessary requirement of the rope and cordage manufacturers. There does not appear to be any likelihood of a linen industry being undertaken in Australia, but, even if it were, there would be no guarantee that Australian flax fibre would measure up to the quality demanded by the trade.

Whilst flax fibre continues to command its present price in competition with Italian hemp there may be possibly some expansion of the present acreage. In the whole of the circumstances, however, with the prospective development of an Australian flax industry definitely restricted to the narrow dimensions already indicated, any aggressive policy of expansion should be avoided.

Experience has shown that climatic conditions render a great part of Australia's farming territory unsuitable for the production of linseed. Heaviest yields are obtained from certain districts in the south of Victoria and from Tasmania. Nowhere in Australia, however, is flax grown solely for seed.

All the evidence tends to show that on the average the general quality of Australian fibre can only be ranked as from medium to poor. Doubtless, good samples are obtained, but the general suitability of the fibre for textile purposes, apart from twines and cordage, cannot be determined except by large-scale commercial tests. Up to the present this proof is lacking. Unfortunately the investigation officers were handicapped by their inability to discover persons who had been trained in the various technological branches of flax fibre, and who might discuss the problems of the Australian industry from a sound practical knowledge of cultural requirements, processing methods, and textile suitability. If, as appearances indicate, the relatively poor quality of Australian fibre results from one or a combination of all the following factors, then the prospects of the ultimate success of the fibre industry are most discouraging:—

(1) Unsuitability of climatic conditions during the growing period.

(2) Growing a crop both for linseed and fibre.

(3) Cutting the crop with a reaper and binder instead of pulling it by hand or machine.

(4) Unsuitability of the climate, owing to its variability, for the dew retting of the straw.

It seems highly probable that the practice of dew retting may be a potent cause not only of the variability of quality of Australian fibre, which was so strongly emphasised by the twine and cordage manufacturers, but also of the low ratio of fibre to tow.

Reports from the Agricultural Departments of all the States except Tasmania (flax growing is against the declared policy of the Tasmanian Department) show that unsatisfactory results have attended the efforts to grow linseed, and until it can be demonstrated that the crop is profitable it would be useless to endeavour to interest farmers in its cultivation. Estimates of the cost of the production indicate that a yield of 12 bushels of linseed per acre at a price of £14 or £15 per ton would, at the present time, just about provide wages and pay expenses.

Tobacco Notes for November.

C. J. TREGENNA, Tobacco Expert.

A Complete Fertiliser is Essential.

To produce a bright "Virginian" type of tobacco suitable for cigarettes and for light pipe smoking it is necessary to use light sandy soils. These soils are lacking in fertility, and practical experience and experimentation in all tobacco-growing countries have proved that heavy applications of a complete fertiliser, that is, one containing nitrogen, phosphoric acid, and potash, are not only essential, but they pay well.

The actual quantities of each of the fertiliser elements to apply will, of course, vary according to conditions, but, based on present available knowledge, the following mixture is regarded as being suitable for general use in the production of light-coloured, mild and pleasant-flavoured tobacco:—

	lb.
Nitrate of soda	100
Dried blood	65
Superphosphate	307
Sulphate of potash	25
Muriate of potash	24
Dolomitic limestone	279
	800

It is advisable to apply the full amount of 800 lb. per acre. In America it has been found that quantities even up to 1,500 lb. per acre are profitable.

The fertiliser should not be broadcasted, but drilled in along the rows about 4 inches deep directly under the plants, preferably about a week prior to planting out. On small areas the fertiliser may, with advantage, be applied in two applications as side dressings, one application to be made in a saucer-sized ring and 3 inches deep around the plant as soon as it has struck, the second application to follow about three weeks later, the circumference of the ring to be increased this time to the size of a plate, and the fertiliser mixed with the soil to a depth of about 4 inches.

Transplanting.

When the plants are from 6 to 8 inches in height and well hardened off, they are ready for setting out. The best plants are those which are most vigorous looking, and with short, broad leaves. Plants which are stunted and yellow, and which have long pointed leaves, should not be used. If the beds are dry and hard they should receive a good soaking some little time before the plants are drawn, so that as little damage as possible is done to the root system. The earth adhering to the plants should not be interfered with more than can be helped.

The best way to remove the plants is with a three-pronged fork. If the tap-root is long, it should be trimmed off with a pair of scissors to about 2 inches. The less handling the plants have the better, and after they have been drawn they should be placed, root downwards, in a cool place, and kept covered with wet bags. Only the plants that can be set out on the same day should be drawn at the one time.

It may here be stated that where the aim of the grower is to produce a fine-textured leaf, the plants should be set out close together, and although past experience must be taken as a guide, it will generally be found that a spacing of 24 to 36 inches in rows 3 feet 6 inches apart on light sandy loam will not induce heavy growth and coarse texture. This distance of 3 feet 6 inches between the rows will allow of horse cultivation, and thus lessen labour.

The ideal weather for planting out is just before and during rain, so that the roots of the plants may have very little check, and growth may be established as soon as possible. Unfortunately, however, weather conditions do not always suit the planter, and possibly owing to the lateness of the season he is forced to set out during dry weather. In this case holes should be made and filled with water, and the plants carefully put in and the earth well packed round the roots. Care should be taken that the roots are not doubled up, and that the hole is properly filled with earth. A simple test of planting is to pull the tips of the two top leaves gently in an upward direction, and if they break off in the fingers the plants are right. Another method where irrigation is not carried out is to make a hole close to the plant and fill with water, and then cover up to prevent evaporation. If the weather continues hot after transplanting, the plants should be shaded with grass. Paper folded in the shape of a tent and held down by two clods of earth is also very effective, and is recommended. It may be necessary to water, and, if so, it is best done early in the morning or about an hour before sundown. Plants which have struck well usually start growing in about ten days, and the covering may be removed.

If irrigation is carried out, a good plan is to turn two shallow furrows together with a light plough, and run the water so that the ridge gets a good soaking some little time before transplanting. The plants should then be set out on the shady side of the ridge, care being taken that the stem and leaves are high enough above the water to avoid being submerged. As soon as possible after transplanting it is advisable to run water through again to set the earth well around the bottom of the roots. After five or six days the crust around the young plants should be lightly stirred and broken.

Representations made by the Minister for Agriculture (Hon. Hugh Main, M.L.A.), have resulted in the Commissioner for Railways issuing directions that ground limestone is in future to be carried at manure rates and conditions, provided a declaration is made on the consignment note that it will be used solely for agricultural purposes.

A Furnace for Flue-Curing Tobacco Barns.

Plans and Details of Construction.

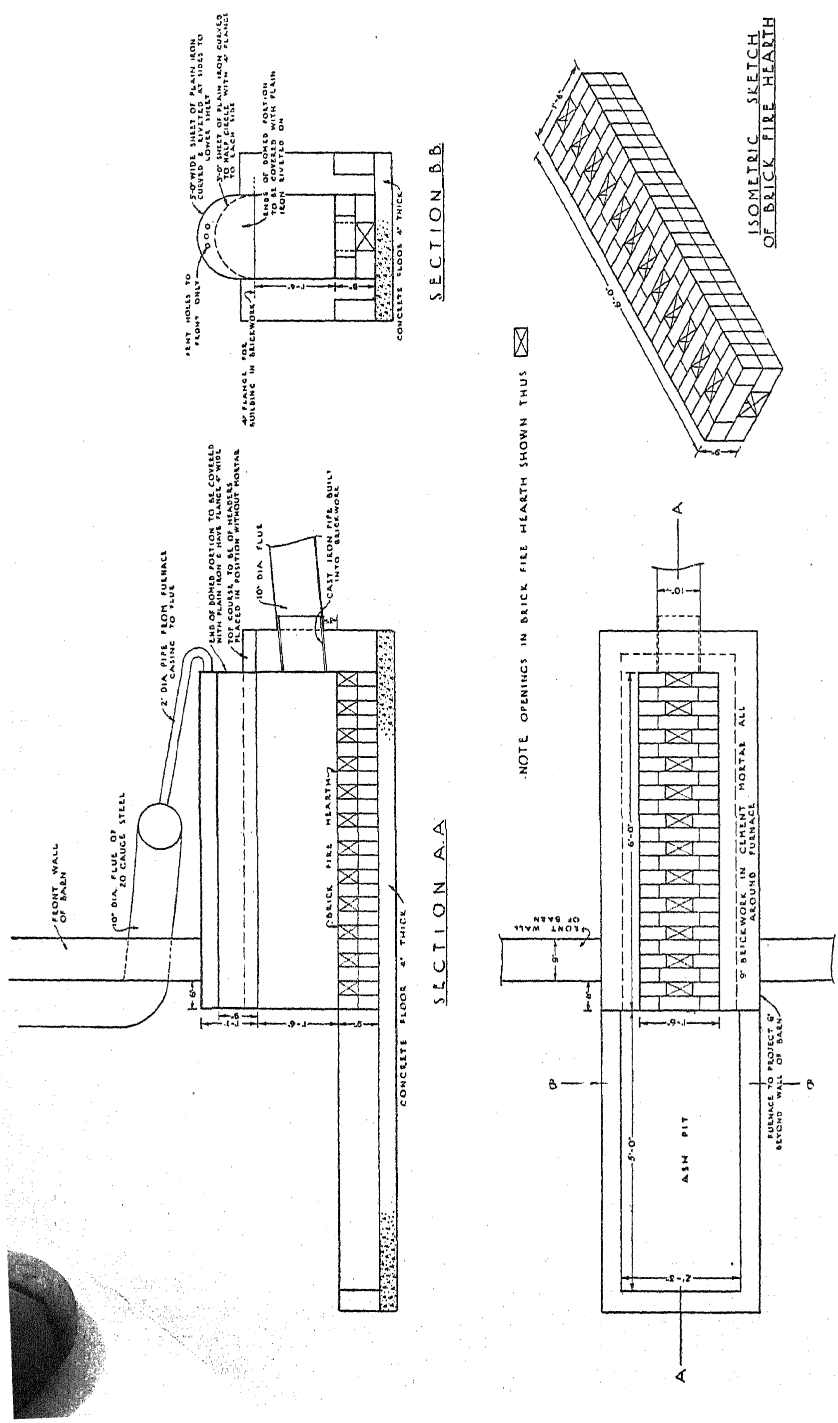
THE drawing of a furnace reproduced opposite shows most of the details required by the person charged with its construction.

As regards the material out of which it should be built, the casing to the furnace should be of bricks in Old English bond laid in cement mortar, the latter to comprise one part of cement to two parts of sand. The bricks before being laid should be well soaked with water, whilst the finished work requires protecting with bags or some such material for at least twenty-four hours in order to protect it from heavy frosts or the drying effects of a hot day. The top course of the furnace casing should be bricks on edge, but these are not laid until after the roof has been placed in position.

A double-domed roof with ventilated air space between is fitted to the furnace in order to guard against the risk of fire. Two sheets of heavy-gauge plain iron (3 feet by 6 feet) are required for the dome. The sheet forming the inner roof is bent to form a 4-inch flange on each side, so that it can be set on the second-top course of brickwork and the top course of headers then placed in position without mortar. The idea here is not so much to enable the roof to be replaced readily when burnt out as to prevent its being burnt out. When the bricks are set in mortar they sweat the portion of the iron roof that is let into the brickwork, and also tend to make the roof hotter, thus more quickly burning it out. The second sheet is not flanged, but merely riveted on to the other sheet at the angles formed by the flanges and the curved section.

The ends of the domed roof are closed in with plain iron, the front section having three vent holes cut in it as shown in the sketch, while a length of 2-inch pipe is let into the back section and leads into the outlet of the main flue pipe. This arrangement creates a "draw," causing a continuous stream of fresh, cool air to be sucked in through the front vent holes and to pass out the pipe at the back. This tends to keep the top of the roof comparatively cool.

The floor of the ashpit is of concrete 4 inches thick. A brick fire hearth is built into the furnace, details of its construction being plainly shown in the sketch. The bricks forming the hearth are placed in position without mortar, but after being well laid are grouted with good clean sand. When the first fire is lighted in the furnace the intense heat generated has the effect of fusing the outside surface of the bricks, thus cementing them together much more strongly than if mortar of any kind were used.



Plans of Furnace for Flu

Poultry Notes.

NOVEMBER.

E. HADLINGTON, Poultry Expert.

A Crisis in the Poultry Industry.

ON present indications it is apparent that poultry farmers are faced with one of the biggest crises ever experienced in the industry, as the average price of eggs is already lower this year than last, and prices are likely to remain lower during the remainder of the flush season, while it does not appear that there will be any substantial reduction in the cost of the main feeding stuffs. It is essential, therefore, that those dependent upon the industry for a living should do everything possible to effect economies without causing any reduction in egg production.

How to Cheapen the Feed Bill.

Those new to the industry may be tempted to reduce the food supply as soon as production commences to decline, but such a course would soon bring about a worse state of affairs, as the birds must have as much food as they require, and any attempt to cut down the ration would prove disastrous. In cases, however, where costly rations are being fed a reduction in cost of feeding may be effected by gradually changing over to a simple balanced ration such as is fed to the Hawkesbury Agricultural College Egg-laying Competition birds and those on the Department's poultry farms. This ration is as follows:—

Morning Mash.		*Evening Feed.*	
Pollard	60 lb.	Wheat	66 lb.
Bran	34 lb.	Cracked maize	34 lb.
Meat meal	6 lb.		100 lb.
	100 lb.		
Salt	22 oz.		

With regard to the evening feed, the proportion of maize can be reduced owing to its higher cost than wheat, and where sufficient green feed is not available lucerne chaff meal or dust could take the place of up to 15 per cent. of the bran without affecting the "balance" of the ration.

Alternative Rations.

Should the price of wheat fall any lower wheat meal could probably be obtained or gristed on the farm at a cheaper rate than pollard or bran, in which case wheat meal could form up to 50 per cent. of the morning mash, as follows:—

Wheat meal	50 lb.
Pollard	20 lb.
Bran	23 lb.
Meat meal	7 lb.
	100 lb.
Salt	22 oz.

Another means of reducing the cost of the morning mash would be to use rice pollard in place of wheat meal, the other ingredients being the same as in the above mash. The difficulty, of course, is that the supply of rice pollard would not be adequate to meet a heavy demand, and for this reason it would be perhaps preferable to use partly rice pollard and partly wheat meal in conjunction with bran and pollard as follows:—

Rice pollard	24 lb.
Wheat meal	24 lb.
Wheaten pollard	24 lb.
Bran	21 lb.
Meat meal	7 lb.
	100 lb.
Salt	22 oz.

Where an abundance of green feed such as lucerne or other crops which can be finely chaffed is available, 20 to 25 per cent. by weight could be used in place of that quantity of bran, but additional green feed may also be given later in the day. Any change decided upon should be made gradually, otherwise production may suffer.

Prevent Wastage.

On some farms a good deal of wastage of food occurs through faulty feed hoppers in cases where dry feed is given, while in other instances the over-feeding of wet mash results in much wastage. These are directions in which a little care would result in a saving without affecting egg production.

One of the common faults with the dry feed hoppers is that they permit of the food being easily scratched out. A suitable type of hopper is illustrated in the Department's free leaflet on the feeding of poultry. Where wet mash is used it is important that it be mixed to a consistency that will be neither too flaky nor too wet. If too much bran is used the mash will not hold together and can easily be scratched about the pen by the birds, and when this occurs it soon becomes dried up and is not eaten.

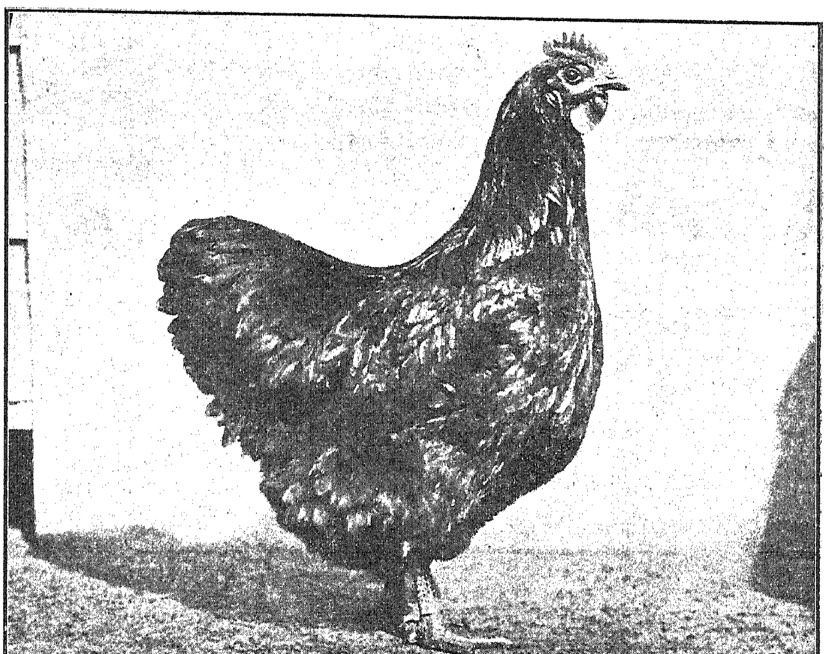
Another reason why on many farms the mash is fed in a very flaky condition is because the ingredients are mixed together before wetting them, instead of scalding the bran first and then mixing in the pollard. This latter method results in a far more satisfactory and appetising mash. For the adult birds the mash should be wet enough to adhere together under pressure with the hands, yet should not be sticky and should break apart when dropped into the feed troughs. The quantity to be given will vary according to the rate of production and the weather, but the birds should have as much as they will consume within an hour without leaving any of the food scattered about. It will usually be found that what is not eaten in that time will be scratched about the pens and much of it wasted. Apart from that aspect, if given too much feed the birds become surfeited with food and production suffers.

Cull Early This Year.

WHILE in normal times the matter of culling to any extent would not be considered until towards the end of December, the position is now such that no poultry farmer can afford to keep hens which are not capable of laying up to expectations for this time of the year. As a guide to the production that might reasonably be expected from a flock comprising half first-year and half second-year hens, the following table, based on a twelve-dozen eggs per hen per annum basis, may be helpful for checking up on the flock:—

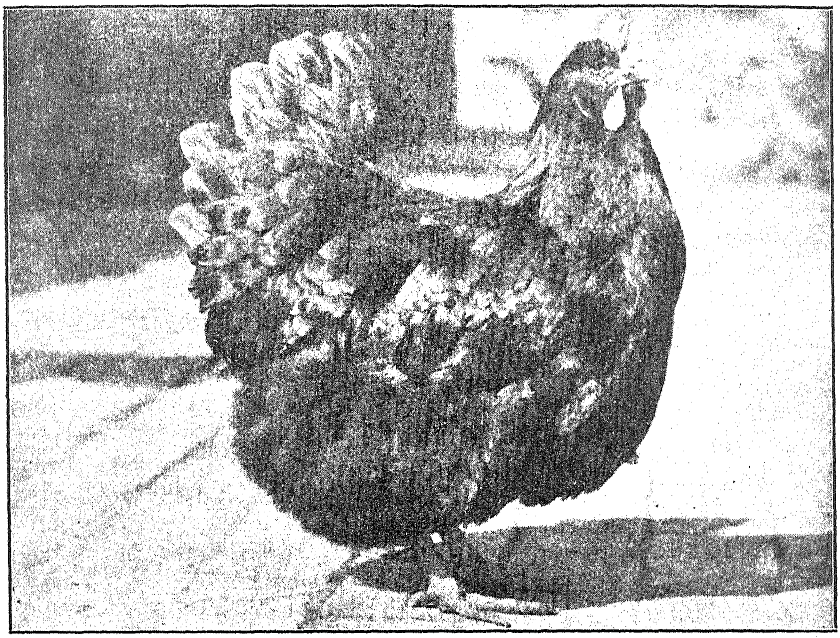
May	4 eggs per hen.	November	17 eggs per hen.
June	6 ,, ,,	December	16 ,, ,,
July	10 ,, ,,	January	13 ,, ,,
August	16 ,, ,,	February	11 ,, ,,
September	19 ,, ,,	March	7 ,, ,,
October	19 ,, ,,	April	6 ,, ,,

Anything in the nature of wholesale culling should not be undertaken (it should not be necessary on a well-managed farm), as this would only result in swamping the market and depressing prices. Moreover, in doing so, many hens which were only temporarily off laying would be sacrificed.



Good Layer.

The best course to follow before deciding upon the number of birds which should be culled is to make a count of the hens in the various pens, and keep a record of the laying for a period of at least a week, and if the rate of production is much below that shown for the particular month in



Poor Layer.

Head of Good Layer.

Head of Poor Layer.

the above table, a close investigation should be made to find out if it is due to faulty management or to conditions which may be responsible for a temporary lull in laying. What is required is a judicious elimination of the hens which are not likely to continue laying throughout the rest of the flush season. This will include mainly those which are not sound in health nor of good physique and also those which have become coarse, both among the first and second year birds. The accompanying illustrations give a good idea of the difference between the "worker" and the "drone." In the former will be noted an alertness in appearance, clean face, fine skull and prominent eye. The poor type shows the reverse, and although some birds of this class may be laying now they are not the sort that will continue, and nothing much will be lost by disposing of them, as they will bring more in the market now than after Christmas, unless, of course, low egg prices causes a rush to market of all and sundry hens, which action cannot be too strongly deprecated.

The best plan for those who are not experienced in culling is to pick out all doubtful birds and place them in a small pen for a week, and if in that time only a few eggs are laid it can be taken that the poor layers have been selected. If, on the other hand, a large number of eggs is laid, it will be a matter of going through them again to ascertain which are laying, and it is here that the condition of the pelvic bones will assist. The layers will be found to have wide-apart pelvic bones and the abdomen will be full and soft, whereas those of the non-layers will be contracted.

Our Birds Attract Attention at the World Poultry Congress.

According to a report received by the Minister for Agriculture (Hon. Hugh Main, M.L.A.), the five trios of fowls (Australorps, White Leghorns and Rhode Island Reds) which were despatched from Sydney in July last to represent the Department and several private breeders at the World Poultry Congress in Rome, arrived safely and in splended condition. The report further states that the birds have been very favourably commented on at the Congress. This must be very satisfactory to all concerned.

A New Cattle Tick Quarantine Line.

The Chief Veterinary Surgeon, Mr. Max Henry, has asked us to draw the attention of stockowners in the north to the fact that a quarantine line has been established from Sandy Hills across to the Queensland Border and that cattle moving southwards over this line must obtain the necessary permits and license under the Stock Diseases Act, and undergo two treatments before such move takes place. It would be well, therefore, for any stockowner in the area concerned who wishes to move cattle to get into communication with Inspector Smith at Woodenbong.

Dairying Notes.

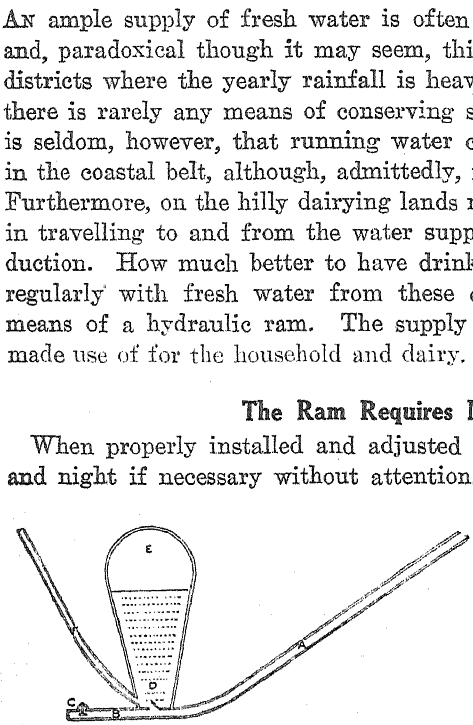
NOVEMBER.

Hydraulic Ram will Ensure Ample Water Supply.

An ample supply of fresh water is often a problem on many dairy farms and, paradoxical though it may seem, this problem is often most acute in districts where the yearly rainfall is heaviest—the rainfall is seasonal and there is rarely any means of conserving supplies for the drier months. It is seldom, however, that running water cannot be found on a dairy farm in the coastal belt, although, admittedly, it is sometimes difficult of access. Furthermore, on the hilly dairying lands much energy is expended by cattle in travelling to and from the water supply. This results in lessened production. How much better to have drinking troughs quite handy and fed regularly with fresh water from these otherwise inaccessible sources by means of a hydraulic ram. The supply thus made available can also be made use of for the household and dairy.

The Ram Requires No Attention.

When properly installed and adjusted the hydraulic ram will work day and night if necessary without attention. The only essential is a fall or "head" of water. The accompanying sketches will serve to illustrate how it works and how to install it.



The Hydraulic Ram.

Water from the reservoir enters the inlet pipe, A. Attached to this pipe is a dome-shaped cylinder containing air, with a valve opening inwards at D. At the extreme end of the inlet pipe is another valve, opening inwards, at C. The discharge pipe is shown at F.

The valve at C is weighted so that it will open when the water in the inlet pipe at B is at rest. To adjust this, the vertical height of the water from the reservoir has to be taken into consideration. As the water enters it commences to flow out through the valve which is open at C. The force of this flow is sufficient to carry the valve up against its seat, and the momentum caused through this flowing column of water being suddenly checked is sufficient to open the valve D, through which a quantity enters until the pressure is relieved, when the valve C opens again, and valve D closes. Water again flows through the outlet valve C, when it is again closed and more water ascends through D. This action goes on repeatedly. The air in the dome-shaped cylinder is compressed, as shown at E, and this

compression forces the water through the outlet pipe, F. The valves work automatically, being regulated by the flow and pressure of the water, and will continue to work without attention as long as the water supply is maintained in the reservoir and the machine is in good order.

The quantity of water a ram will deliver varies under different conditions, but it may be taken as a general rule that one-seventh part of the water which enters the ram can be raised and discharged four times as high as the fall applied. Thus a fall of 10 feet would raise 1 gallon out of every 7 entering the ram 40 feet high, or half a gallon 80 feet high.

The inlet or drive pipe, A, leading from the supply in the reservoir (the surface of the water in which should be kept constant) should be from 50 to 200 feet in length, according to the work required. It should also be three-fourths as long as the height the water has to be raised. For example, to force water to a vertical height of 100 feet, the drive pipe should be 75 feet in length.

The delivery pipe, F, may be almost any length horizontally, but should not be more than five to ten times higher than the fall applied to the ram. When there is a fall of, say, 10 feet, the vertical height of delivery pipe should be from 50 to 100 feet higher than the ram.

The Hydraulic Ram. General Arrangement.

The fall should, therefore, be from five to ten times less than the height to which the water has to be raised. If, for example, it is necessary to raise the water 100 feet high, the fall or head applied to the ram should be from 10 to 20 feet. When heavy lifts are required, the length of the inlet pipe may be advantageously increased, or where this is not practicable the pipe may be bent in a coil of 6 or 7 feet diameter. The size of the delivery pipe should always be much smaller than the inlet or feed pipe. For instance, a ram having a 2-inch diameter inlet pipe would require an inch delivery pipe, a 4-inch pipe would require a 2-inch delivery, and so on.

The Profitableness of Fertilising Pastures.

THE fertiliser treatment which gives the most economical results on the pastures at Berry Experiment Farm is ½ ton lime every three years, 2 cwt. superphosphate every year, and also 2 cwt. sulphate of ammonia each year. With lime at £1 12s. per ton, superphosphate £5 per ton, and sulphate of ammonia £12 per ton, the cost of treatment works out at £2 per acre per year.

A comparison of the returns from the treated and untreated paddocks is interesting. An area in which the pastures were fertilised and properly managed produced at the rate of 219 lb. butter-fat per acre, which at 10d. per lb. works out at a return of £9 2s. 6d. per acre per year. An area which was not fertilised but on which the pastures were properly managed produced at the rate of 118 lb. butter-fat per acre at 10d. per lb., equalling a return of £4 18s. 4d. per acre per year, as compared with a return of only 25 lb. butter-fat at 10d. for £1 0s. 10d. per acre, from a paddock that was neither fertilised nor managed.

In addition to improving the return there is the satisfaction of knowing that the treated land is still better at the end of the season than the untreated land, and that the cattle are improved in every respect for having grazed on the more nutritious pasture.

Further evidence of the value of pasture improvement is indicated by the past season's production figures at Berry Farm. The total average production per cow for the year ended 30th June last was 8,910 lb. milk testing 4.22 per cent., or 376 lb. butter-fat. Compare these figures with those for the year ended 30th June, 1927, before pasture improvement work was undertaken seriously. In that year the production was 7,562 lb. milk of 3.6 per cent. test, equal to 272 lb. butter-fat per cow. It is of more than passing interest to know that last year's production figures include the milk of many heifers which are the progeny of the first animals reared on the treated pastures at Berry Farm, and they show a notable improvement in both appearance and production.—P. WALLER, Manager, Experiment Farm, Berry.

Hot Weather Demands Greater Vigilance.

GENERALLY speaking, greater care in the handling of milk and cream becomes necessary during the summer months. Many dairymen are loth to realise that milk and cream are very delicate substances, that they readily absorb taints and odours and that their flavour and keeping qualities are easily spoilt. Scrupulous care must be taken, therefore, to prevent their pollution, not merely by dust, dirt and flies, and by the minute portions of the stale milk or curd which adhere to vessels unless they are regularly and thoroughly rinsed, scalded and scoured bright, but also by the smells and taints given off from dung heaps, dirty bails and yards, neglected skim-milk receptacles, and sour milk, rubbish and filth. These should not be allowed to accumulate or remain near places where cows are milked, nor where milk or cream is stored. Furthermore, workers must not be allowed to smoke whilst engaged in the milking shed or milk room, as the smoke taints the milk.

The foregoing is taken from *The Dairy Manual,* a copy of which should be in the hands of every dairy-farmer. It contains a copy of the Dairies Supervision Act and regulations and explains very clearly the dairyman's obligations in regard to the production and distribution of milk and cream. It also contains numerous plans of dairy-farm buildings.

Copies of the *Manual* are obtainable from the Department of Agriculture, Box 36A G.P.O., Sydney; price 1s. 1d. posted.

Miscellaneous Items and Hints.

Spread the Manure Droppings.

IF the droppings are not harrowed regularly after each grazing, they produce patches of rank growth which are left by stock throughout the entire season, said Mr. P. Waller, manager of Berry Experiment Farm, addressing the recent Illawarra District Agricultural Bureau Conference at Camden. This condition increases with each successive grazing and results in the loss of a large proportion of valuable grazing area; it may even happen that much of this manure-covered land, if not harrowed, will not be available for years unless the droppings are ploughed in or removed in some way, continued Mr. Waller.

After careful observation it has been calculated that the year's manure from thirty cows contains fertility equal to that found in the following commercial fertilisers:—9 tons sulphate of ammonia, 2½ tons superphosphate, and 4½ tons sulphate of potash. At present prices these would be worth about £200 per year to the farmer and would represent a very real contribution towards his farm's upkeep. On the other hand, if the droppings are left unspread, the capacity of the pasture is limited in many respects. The wisdom of using the grass harrow to spread the droppings is therefore very apparent.

The Brahman (Zebu) Cross is a Hardy Type.

According to an extract, the Proceedings for 1933 of the American Society of Animal Production contains a paper dealing with the growth of different types of cattle in Louisiana, including crosses with the Brahman (Zebu). The writers state that the Brahman is pre-eminently a grazing animal and makes good gains on coarse grasses. The Brahmans do not appear to suffer to the same extent from flies, mosquitoes and external and internal parasites. They also stand the heat better. Further, at the Louisiana Station no Brahman grades have died from bloating on clover, while losses among the breeds of British origin are sometimes severe. The authors state that the principal advantage of the Brahman lies in its capacity for making gains on grass alone, a quality that is of great importance on the coastal plains.

Vaccines and Drugs Valueless for Contagious Abortion.

On numerous occasions stockowners have been advised against the use of vaccines of any type in connection with contagious abortion, writes Mr. Max Henry, Chief Veterinary Surgeon. This matter has recently engaged the attention of the International Bureau of Epizootics in Europe. The Bureau has issued a very comprehensive report on the matter, which fully bears out the attitude adopted by this Department. In the course of this report particulars are given of a recent experiment with four different types of vaccines available in Europe. None of these was found to be of any value. Details are also given of the attempted treatment of cattle with a long list of drugs of modern type, but again none was found capable of protecting cattle against contagious abortion.

Be on the Lookout for Heart Worm in Dogs.

Consequent upon the reported discovery of heart worm in dogs in the Moree district and its later discovery in a fox in the same district, the Department is anxious to determine how widespread is the parasite.

The fox from which it was taken was very weak and it is understood several landholders in the district have noted a similar weakness in foxes, but had assumed that they were affected with some form of distemper. It is clear that if this parasite is present to any extent in the fox, control will be extremely difficult, if not impossible, and in order to assist in determining this point it is asked that any stockowners who notice foxes affected with any disease should endeavour to shoot one and submit the heart and lungs for examination. The inspectors of stock in every district will be pleased to forward the specimens to Glenfield Veterinary Research Station.

It would be as well, also, if dogs in the country districts are noted to be affected or are suspected of being affected that the heart and lungs of any that die could be submitted for examination. Affected animals become disinclined to exert themselves, lose condition, become poor and weak, lose appetite, and suffer from nasal discharge. Cough may be present also.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry Date.
Lunacy Department, Parramatta Mental Hospital	12	1 Nov., 1933
Department of Education, Gosford Farm Homes	38	2 ,, 1933
E. E. McMullen, Springnook, Holbrook	31	3 ,, 1933
W. R. Boughton, Holbrook	33	3 ,, 1933
C. Maynard, Holbrook	12	3 ,, 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 ,, 1933
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	43	25 ,, 1933
G. Powell and Sons, "Loch Lomond," Armidale	22	26 ,, 1933
Stace Bros., Taylor-street, Armidale	26	1 Dec., 1933
Department of Education, Brush Farm, Eastwood	8	3 ,, 1933
Lunacy Department, Morisset Mental Hospital	29	7 ,, 1933
W. W. Martin, "Narooma," Urana-road, Wagga...	150	14 ,, 1933
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1933
E. E. Winder, Wybong-road, Musswellbrook	40	22 ,, 1933
C. J. Parbery, Allawah, Bega	142	8 Jan., 1934
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay	8	9 ,, 1934
G. H. Hooper, Oak Hill, Bethungra	10	19 ,, 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	81	22 ,, 1934
A. L. Logue, Thornboro, Muswellbrook	45	25 ,, 1934
F. C. Harcombe, Hillcrest Farm, Warialda-road, Inverell	13	27 ,, 1934
J. B. Burtenshaw, "Sunnyside," Inverell	42	27 ,, 1934
Parker Bros., Hampton Court Dairy, Inverell	82	27 ,, 1934
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1934
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1934
W. K. Frizell, Rosenstein Dairy, Inverell	37	2 ,, 1934
W. Pigg, Redlands Dairy, Inverell	27	2 ,, 1934
A. N. de Fraine, Happy Valley Dairy, Inverell	28	3 ,, 1934
G. L. Genge, "Easton," Armidale	39	7 ,, 1934
J. Davies, Puen Buen, Scone (Jerseys)	244	9 ,, 1934
Forster & Sons, Abington, Armidale	189	12 ,, 1934
Newington State Hospital and Home	91	16 ,, 1934
A. B. Finney, Fox Ground, Gerringong	33	17 ,, 1934
Lidcombe State Hospital and Home	153	20 ,, 1934
Lunacy Department, Gladesville Mental Hospital	34	22 ,, 1934
Riverina Welfare Farm, Yanco	89	24 ,, 1934
Department of Education, Yanco Agricultural High School	39	24 ,, 1934
W. J. Miller, 199 Mann-street, Armidale	7	6 Mar., 1934
New England Girls' Grammar School, Armidale	41	8 ,, 1934
F. C. Butler, Yarranung, Bega	122	24 ,, 1934
G. W. Young, "Boorganna," via Wingham	39	30 ,, 1934
Hawkesbury Agricultural College, Richmond (Jerseys)	118	3 April, 1934
A. D. Frater, "Fairview Dairy," Inverell	61	5 ,, 1934
Cowra Experiment Farm	26	27 ,, 1934
St. Joseph's Girls Orphanage, Kenmore	10	4 May, 1934
G. A. Parish, Jerseyland, Berry	93	5 ,, 1934
Marion Hill Convent of Mercy, Goulburn	27	5 ,, 1934
St. Joseph's Convent, Reynold-street, Goulburn	4	5 ,, 1934
St. John's Boys' Orphanage, Goulburn	18	5 ,, 1934
W. M. McLean, Five Islands road, Unanderra	76	6 ,, 1934
Koyong School, Moss Vale	3	8 ,, 1934
Miss N. C. Brenan, Arankamp, Bowral	15	10 ,, 1934
Tudor House School, Moss Vale	21	13 ,, 1934
Limond Bros., Morisset	38	1 June, 1934
Navua Ltd., Grose Wold, via Richmond (Jerseys)	29	2 ,, 1934
Hurlstone Agricultural High School, Glenfield	44	22 ,, 1934
Berry Experiment Farm, Berry	145	13 July, 1934
Grafton Experiment Farm	271	14 ,, 1934
Australian Missionary College, Cooranbong	62	19 ,, 1934
William Thompson Masonic School, Baulkham Hills	37	20 ,, 1934
A. A. Campbell, Breadalbane, Mullumbimby	51	16 Aug., 1934
P. Ubrihien, Corridgeree, Bega	129	17 ,, 1934
E. W. Flower, Binna Burra	66	17 ,, 1934
E. C. Nicholson, Jillamatong, Corowa	137	20 Sept., 1934
St. Patrick's College, Goulburn	8	21 ,, 1934
C. Wilton, Muswellbrook	63	21 ,, 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 ,, 1934
Wagga Experiment Farm (Jerseys)...	65	25 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone	92	9 Nov., 1934

Tubercle-free Herds—*continued.*

Owner and Address.	Number tested.	Expiry date.
Wolaroi College, Orange ...	11	10 Nov., 1934
J. L. W. Barton, Wallerawang ...	16	17 ,, 1934
Wollongbar Experiment Farm, Lismore (Guernseys) ...	123	11 Jan., 1935
George Rose, Aylmerton ...	2	21 Feb., 1935
Mittagong Farm Homes ...	36	22 ,, 1935
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	19	23 ,, 1935
T. H. Maples, Racecourse Farm, Bega ...	48	2 Mar., 1935
P. M. Burtenshaw, Killean, Inverell ...	63	28 ,, 1935
J. P. McQuillan, Bethungra Hotel, Bethungra ...	25	4 April, 1935
W. Newcomb, "Minnamurra," Inverell ...	85	6 ,, 1935
Lunacy Department, Kenmore Mental Hospital ...	84	4 May, 1935
St. Michael's Novitiate, Goulburn ...	4	4 ,, 1935
Rydalmere Mental Hospital ...	65	11 ,, 1935
H. F. White, Bald Blair, Guyra (Aberdeen Angus) ...	261	28 June, 1935
St. John's College, Woodlawn, Lismore ...	34	29 ,, 1935
W. S. Turnbull, Flanders Avenue, Muswellbrook ...	37	28 July, 1935
Sacred Heart Convent, Bowral ...	12	3 Aug., 1935
E. P. Perry, Nundorah, Parkville (Guernseys) ...	23	13 Sept., 1935
James McCormack, Tumut ...	81	28 ,, 1935

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis :—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—Max Henry, Chief Veterinary Surgeon.

Abortion-free Herds.

The following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free.

Owner and Address.	Number in herd.
Martin Bros., "Narooma," Urana Road, Wagga Wagga ...	86
Cann, H. J., The Gap, Alstonville ...	...
White, F. J., and Sons, Bald Blair, Guyra ...	238
Mott, T., Main Arm, Mullumbimby ...	26
Henderson and Son, Upper Wantagong, Holbrook ...	95
Hawk, J. T., Ben Lomond ...	42
Sams, C. R., Wilson's Creek, Mullumbimby ...	34
Walker, Jas. R., "Strathdoon," Wolseley Park ...	32
East, N. A. L., East Valley, Gum Flat, via Inverell ...	51

—Max Henry, Chief Veterinary Surgeon.

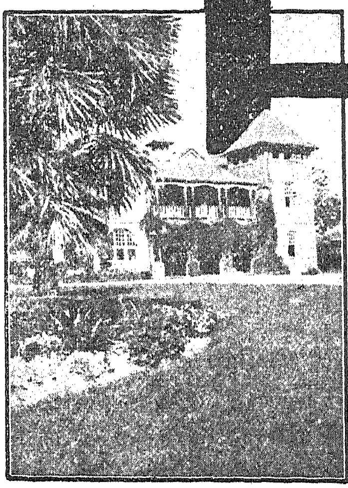
Infectious Diseases Reported in September.

The following outbreaks of the more important infectious diseases were reported during the month of September, 1933 :—

Anthrax ...	Nil.
Blackleg ...	3
Piroplasmosis (tick fever) ...	Nil.
Pleuro-pneumonia contagiosa ...	5
Swine fever... ...	Nil.
Contagious pneumonia ...	1
Necrotic enteritis ...	1

—Max Henry, Chief Veterinary Surgeon.

DEPARTMENT OF AGRICULTURE, NEW SOUTH WALES.



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The Principal, Hawkesbury Agricultural College, Richmond.	*or*	The Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney

The Feeding of Dairy Cows.

[Continued from page 778.]

S. R. BALLARD, H.D.D., Senior Dairy Instructor.

In the previous instalment of this article the economy of growing and utilising farm crops was discussed and the importance of feeding a balanced ration stressed. The essential food constituents were also defined and discussed in regard to the part each one plays in meeting the requirements of the dairy cow. In this, the concluding section of the article, Mr. Ballard explains the practical application of those principles.

An Ideal Ration.

A well-balanced ration for a dairy cow is one wherein the factors mentioned in the previous instalment are taken into consideration and the proportion of protein to carbohydrates is about 1 to 5 or 1 to 6 (1 lb. digestible nitrogenous matter to 5 or 6 lb. carbohydrates). The amount of dry roughage required for a cow in milk may be stated to be approximately 2 lb. to every 100 lb. of live weight, or 1 lb. of roughage and 3 lb. of silage to the same live weight. A ration for maintenance purposes only does not need to be as rich in protein as in the case of a cow producing, say, 30 lb. of milk daily; a ration of 1 to 12 or 1 to 13 would be the most economical for simply maintaining the animal in good health. On the other hand, young growing animals require a much narrower ration than that of a cow in milk, in order to provide for flesh, muscle, bones, tissue, etc. The nutritive ratio in this case could be as low as 1 to 3. For maintenance purposes only, a dairy cow of 800 lb. to 1,000 lb. live weight requires approximately .7 lb. of digestible crude protein, 7 lb. of digestible carbohydrates and .1 lb. of fat. A cow would require approximately 50 lb. of silage or 50 lb. of paspalum daily to supply this amount of digestible nutrients.

It should be borne in mind that the fodder compositions given hereunder are not to be regarded as absolute: locality, climate, maturity and growth, and the fertility of the soil in which the crop has been grown will all affect the feeding value of a fodder. Nor, apart from this reason, must the results of the recommendations be expected to be invariable; those obtained from dairy stock under official record indicate that individual cows differ somewhat in their response to similar feed. **The rations here given supply the requirements of a dairy cow without consideration of pasture, and economies could therefore be effected on farms where good balanced pasture is available and a system of pasture management is practised. Any such economy, however, should be achieved by a reduction in the quantity of the ration rather than any alteration in the nutritive balance.**

Requirements According to Milk Production.

The amount of milk a cow is giving, together with the fat content of the milk, materially affects the nutrient requirements of the animal, and when a herd of dairy cows is in good condition it is upon due allowance for these two factors chiefly that the success of a ration depends. The following table shows the requirements of a cow according to the butter-fat content of the milk:—

NUTRIENT Requirements of a Cow According to Butter-fat Content of the Milk.

TABLE A.

	Dry Matter.	Digestible Crude Protein.	Digestible Carbohydrates (including fat.)
	lb.	lb.	lb.
For maintenance of 800 to 1,000 lb. live weight ...	15	0·7	7·1
And for each lb. of 3·5 per cent. milk add—	...	0·055	0·25
,, ,, 4·0 ,, ,, ...	...	0·060	0·27
,, ,, 4·5 ,, ,, ...	...	0·065	0·29
,, ,, 5·0 ,, ,, ...	...	0·068	0·32
,, ,, 6·0 ,, ,, ...	...	0·070	0·35

From the above table it is a simple matter to arrive at the total nutrients required by cows giving varing amounts of milk. This is done by multiplying the nutrient factors corresponding to the fat test by the amount of milk. Therefore, to fulfil the requirements of a cow giving, say, 25 lb. of 4 per cent. milk as per Table A, the following would suffice:—

TABLE B.

	Digestible Crude Protein.	Digestible Carbohydrates (including fat).
	lb.	lb.
Maintenance allowance ...	0·70	7·1
For 25 lb. of milk	1·50	6·75
	2·20	13·85

To arrive at the ratio of crude protein to carbohydrates, the amount of carbohydrates is simply divided by the amount of protein. The nutritive ratio of a ration is the ratio which the proteins bear to the carbohydrates-plus-two-and-a-quarter-times-the-fat.

Preparation of a Ration.

Given lucerne hay and corn silage as fodder, how would we prepare a balanced ration for a cow yielding 25 lb. of milk of 4 per cent. test?

To be correct the proportions of nutrients should compare approximately with those in Table B above. Utilising lucerne hay and corn silage as a

basis for its formulation, and taking, say, 10 lb. of lucerne hay and 30 lb. of corn silage, we find that the nutritive value of these is as follows:—

	Dry Matter.	Protein.	Carbohydrates.	Fat.
	lb.	lb.	lb.	lb.
10 lb. lucerne hay	9·14	1·06	3·9	·09
30 lb. corn silage	7·9	·33	4·5	·21
	17·04	1·39	8·4	·30

By utilising these two fodders in the proportions stated, however, there is a big deficiency in both proteins and carbohydrates as compared with the above standard, and it will be necessary to utilise some concentrates which we know are rich in digestible nutrients. Bran contains a high percentage ratio of protein and has a nutritive ratio of about 1:3 to 1:4. This would help to increase the protein content of the ration, but it will be necessary to include a class of grain to increase the carbohydrates. We will try 6 lb. of bran and 2 lb. of corn meal. The ration now stands—

	Dry Matter.	Protein.	Carbohydrates.	Fat.
	lb.	lb.	lb.	lb.
10 lb. lucerne hay	9·14	1·06	3·9	·09
30 lb. corn silage	7·9	·33	4·5	·21
6 lb. bran	5·39	·75	2·49	·18
2 lb. corn meal	1·79	·15	1·35	·09
	24·22	2·29	12·24	·57

This ration has a nutritive ratio of 1:5·9. The amount of dry matter is sufficient, the crude protein is practically the same as the standard example, and the combination of carbohydrates and fats compares with the standard very favourably.

Some Useful Balanced Rations.

	Crude Protein.	Carbo-hydrates.	Fat.	Dry Matter.	Nutritive Ratio.
	lb.	lb.	lb.	lb.	
(1) 10 lb. wheaten hay	·40	4·85	·08	9·19	
15 lb. lucerne hay	1·59	5·85	·135	13·71	
4 lb. bran	·5	1·66	·12	3·59	
	2·49	12·36	·335	26·49	1 : 5·3
(2) 20 lb. maize silage	·22	3·0	·14	5·26	
10 lb. lucerne hay	1·06	3·9	·09	9·14	
6 lb. ground corn	·45	4·05	·27	5·37	
4 lb. bran	·5	1·66	·12	3·59	
	2·23	12·61	·62	23·36	1 : 6·2

SOME Useful Balanced Rations—*continued.*

	Crude. Protein.	Carbo-hydrates.	Fat.	Dry Matter.	Nutritive Ratio.
(3) 20 lb. oaten hay	·9	7·62	·34	17·6	
5 lb. lucerne hay	·53	1·95	·04	4·57	
2 lb. corn meal	·15	1·35	·09	1·79	
2 lb. linseed meal	·63	·75	·05	1·80	
	2·21	11·67	·52	25·76	1 : 5·8
(4) 25 lb. green corn stalks	·25	3·20	·10	5·47	
10 lb. lucerne hay	1·06	3·9	·09	9·14	
4 lb. bran	·5	1·66	·12	3·59	
6 lb. ground corn	·45	4·05	·27	5·37	
	2·26	12·81	·58	23·57	1 : 6·2

AVERAGE COMPOSITION OF COMMON FOODSTUFFS (Digestible Nutrients in 100 lb.*)

	Crude Protein.	Carbo-hydrated.	Fats.	Dry Matter.	Ratio.
Green Fodders—	lb.	lb.	lb.	lb.	
Maize	1·0	12·8	·4	21·9	1 : 13·7
Sweet sorghum	·7	14·1	·6	24·9	1 : 22·1
Barley	2·3	11·5	·4	23·2	1 : 5·4
Oats	2·3	11·8	·8	26·1	1 : 5·9
Rye	2·1	12·2	·5	21·3	1 : 6·3
Wheat	2·8	15·1	·6	27·4	1 : 5·9
Lucerne	3·3	10·4	·4	25·3	1 : 3·4
Cow pea	2·3	8·0	·3	16·3	1 : 3·8
Field pea	2·6	8·6	·3	18·8	1 . 3·6
Soy beans	3·2	10·2	·5	23·6	1 : 3·5
Saccaline	1·1	12·4	·4	20·0	1 : 12·1
Rye, 5 inches high ...	5·1	6·2	·7	18·1	1 : 1·5
Oats, 8 inches high ...	3·4	4·1	·5	13·0	1 : 1·5
Hay—					
Barley	4·6	48·2	·9	92·6	1 : 10·9
Oats	4·5	38·1	1·7	88·0	1 : 9·3
Rye...	2·9	41·1	1·1	91·9	1 : 15·0
Wheat	4·0	48·5	·8	91·9	1 : 12·6
Lucerne	10·6	39·0	·9	91·4	1 : 3·9
Silage—					
Maize	1·1	15·0	·7	26·3	1 : 15·1
Sorghum	·6	11·6	·5	22·8	1 : 21·2
Concentrates—					
Maize grain	7·5	67·8	4·6	89·5	1 : 10·4
Wheat grain	9·2	67·5	1·5	89·8	1 : 7·7
Oat grain	9·7	52·1	3·8	90·8	1 : 6·3
Barley grain	9·0	66·8	1·6	90·7	1 : 7·8
Cottonseed meal	31·6	25·6	7·8	92·1	1 : 1·4
Linseed meal	31·7	37·9	2·8	90·4	1 : 1·4
Bran	12·5	41·6	3·0	89·9	1 : 3·9

* Most of these analyses are from "Feeds and Feeding," by Henry and Morrison.

The Cheese Industry.

ARE DAIRYMEN MISSING A GOLDEN OPPORTUNITY?

A. B. SHELTON, Senior Dairy Instructor.

For the last twenty years the production of cheese in New South Wales has ranged between 2,500 and 3,000 lb. per year, whereas our local requirements, even on the present low basis of consumption (3½ to 4 lb. per head) range from 4,000 to 4,500 tons. Thus, it is necessary to import some 1,500 to 2,000 tons every year. Are there any good reasons why we should not manufacture locally this extra quantity? Read what Mr. Shelton has to say on the matter.

The South Coast, the Home of Cheese-making.

ALTHOUGH the cheese industry caters for little more than 3 per cent. of the total volume of milk produced in New South Wales, and the maximum amount of cheese produced per year has not increased to any extent during the last twenty years, it is nevertheless an industry of great importance to a section of our dairy producers.

The early history of cheese manufacture is largely a story of the development of dairying on the far south coast, where cheese-making was initially practised by the early pioneers as a means of providing a palatable and nutritious article of diet. As dairy production increased, naturally cheese became a tradeable product in those districts, and more distant markets were sought for surplus production. Cheese production in New South Wales in 1820 was estimated as under 50 tons, while in 1858 approximately 600 tons were produced. By 1890 production had increased to 2,100 tons, and yet in 1930 the total manufacture did not exceed 2,800 tons, and fluctuated between 2,800 and 3,000 tons in the following years; in fact, it may be said that the production of cheese in this State has remained steady at between 2,500 and 3,000 tons per annum for a period of at least twenty years, varying only in accordance with the effect of seasonal conditions on the volume of milk production.

The North Coast's Entry into the Industry.

Although these figures suggest that very little expansion of cheese manufacture has taken place in recent years, it is interesting to note that fifteen years ago only a small amount of cheese was produced in the northern areas, while to-day over 35 per cent. of the total production comes from districts north of Newcastle. What then has happened in the far south coast areas? Briefly, the more rapid development and better organisation of the butter industry on the lines of co-operative factories has gradually absorbed a considerable proportion of the supplies of milk originally retained on the farms for manufacture into cheese in farm factories. This change was

hastened by the introduction of home separation of cream for supply to central butter factories. Thus, whereas ten years ago some eighty registered cheese factories in New South Wales produced around about 6,000,000 lb. of cheese per annum, mainly on the south coast, last year, fifty-four registered factories, of which only thirty-three are situated south of Sydney, manufactured a similar amount of cheese. Of the fifty-four factories referred to, fifty-one are manufacturing cheddar cheese, two are making special or fancy varieties, and one is converting matured cheddar and Gruyere into the modern processed cheese moulded in tinfoil wraps, etc. Thus, the main output of New South Wales factories consists of cheddar cheese, which is easily the most popular variety in English-speaking countries.

Some idea of the relative size of these factories is indicated by the fact that twenty-five, or approximately 50 per cent. of those making cheddar, come within the registration classification of "farm dairy produce premises" under the Dairy Industry Act, each being equipped only to handle the milk produced from the owner's cows. The remainder of the factories are registered as "dairy produce factories," being mainly co-operative in nature and responsible for 75 per cent. of the cheese production in this State.

Local Demand Exceeds Production.

The consumption of cheese in the State ranges between 3½ and 4 lb. per capita, and thus our population requires annually between 4,000 and 4,500 tons for local use. This is far in excess of the amount produced annually, and after allowing for exports as ships' stores, trade with eastern countries and occasional shipments overseas to clear the market, it is necessary to import some 1,500 to 2,000 tons every year from other states to cope with consumption. A small proportion is, of course, regularly brought from overseas countries in the form of varieties not at present procurable locally, but it is noteworthy that at the present time two new factories are being equipped to cater for special trade of that type.

It would seem, nevertheless, that we have a ready market capable of absorbing approximately 2,000 tons additional production, and on comparing local cheese values with butter values it might be suggested that the dairymen of New South Wales are missing an opportunity by not taking steps to produce more cheese to meet local requirements. To those who may be considering such a proposal I would say that until our cheese producers take adequate steps to ensure that all New South Wales cheese can be guaranteed to be of choicest standard, interstate trade, controllable at present only by trade agreements of a voluntary nature, would force our producers into a greater volume of unprofitable export. This will be understood when it is noted that in the past season, 1932-33, the adjoining States of Queensland and Victoria produced and exported from the Commonwealth over 3,800 tons, representing surplus over and above state and interstate trade. It would seem obvious that New South Wales cheese manufacturers, before attempting to expand production, need to safeguard

their local market by taking every step possible to reach an objective of 100 per cent. choicest quality, with provision for sale of cheese on grade values.

In the past, cheese manufacture has returned to producers slightly better net values than butter manufacture, and during recent years an average advantage of approximately ½d. per gallon of milk used has been shown in cheese factory returns, after accounting for usual costs of manufacturing and selling. This, however, does not take into account the greater cost of carting milk to a central cheese factory seven days per week, as compared with delivering cream, representing one-tenth of the volume of the equivalent milk, only four days per week.

The Food Value of Cheese.

It has often been said—indeed, it has become quite a common saying—that cheese is indigestible, and should, therefore, be avoided by anyone subject to digestive troubles. To the contrary, when cheese of choicest quality is matured, it is in actual fact more digestible than many other foods we eat, and is often specifically recommended by medical authorities, not only for people in normal health, but for those suffering from dietetic troubles. Food analysts who delve into such matters as comparative food values, tell us that 1 lb. of cheddar cheese contains as much protein as 1½ lb. of sirloin beef and 1⅜ lb. of white poultry flesh, and, on the basis of the energy it supplies to the human system, that 1 lb. of cheddar cheese is equal to 2 lb. of sirloin beef or 2½ lb. of white flesh from the breast of a fowl.

What a difference in energy value there must be then between a meat sandwich and the tasty cheese sandwich, and what an astounding difference it would make in the quantity of cheese consumed every year if only half of the people in this State ate daily the quantity of cheese it takes to make a full sandwich, say half an ounce. Assuming that half our people never touch cheese at present and could be induced to eat that ½ oz. per day, the increased consumption in New South Wales would more than absorb the whole of the cheese exported overseas from Australia each year. Similar results could, of course, be obtained if the per capita consumption for Australia was to increase a mere 2 lb. per head per annum, a quantity amounting to less than 3 oz. per month for each person.

The Miner Recognises the Energy Value of Cheese.

It is well known that a large proportion of our people are not averse to cheese, and, in fact, enjoy it as a supplement to their daily fare when available in a form pleasing to their palates. Apart from those who desire cheese in the form of special varieties having special qualities, the great majority of people demand only good cutting digestible cheddar, with either a rich mild flavour or else that commonly referred to as having a clean bite. It is well that these two types can be traced to almost separate avenues of trade. In mining districts, particularly our great coal areas, those accustomed to working underground recognise the part cheese can

play in maintaining bodily energy and daily use cheese for the mid-shift meal underground in preference to meat. Moreover, meat rapidly becomes unpalatable when kept in the luncheon bag under mining conditions. Similarly, the strong-flavoured cheese is not palatable under underground conditions, and so is built up an important trade for a mild cheese which will cut in slices.

Manufacturers supply this trade most successfully with cheese made from clean pasteurised milk. Prior to the successful introduction of pasteurisation into the cheese-making process, the practice was to cater for this trade with new cheese of high moisture content, in order that good cutting and slicing qualities, together with little or no flavour of a real cheesy nature, be maintained. High mosture content means more rapid maturation in cheese, and rapid maturation goes almost hand in hand with the development of undesirable flavours.

Pasteurised Milk Produces a Mild-flavoured Cheese.

Pasteurisation of cheese milk simplified the problem of manufacturing a cheese to suit the mining trade, so much so that among cheese men the keenest advocates of pasteurisation are those making cheese principally for the coal-fields' trade. In other words, pasteurisation combined with a system of adjusting the fat content in cheese milk to a normal proportion in relation to the solids not fat, has enabled uniform quality cheese containing only well-balanced moisture content to be made all the year round, resulting in cheese which will stand up to all requirements, including storage for winter sale when stocks may be short. With the exception that pasteurisation is almost essential to produce regularly a mild-flavoured cheese, the principles of manufacture are in no way different to those which it is recommended to follow when manufacturing cheese designed to develop a full, mellow flavour with a clean bite as soon as maturation has proceeded to a satisfactory degree.

As a result of carefully watching variations in methods of manufacture for a number of years and encouraging the adoption of an almost standard method of making cheddar cheese, whether from pasteurised or raw milk, the average texture of New South Wales cheese has been improved from the mealy acid type, prevalent a few years ago, to a smooth excellent-cutting type, with more lustre and even colour. The spirit of co-operation existing between the factory managers and the Department of Agriculture has been strong enough to achieve this result. I believe it is strong enough to force the necessary steps to eliminate, or at least reduce to a minimum, the present large percentage of factory output which develops undesirable flavours.

Hares and rabbits at times do considerable damage in orchards by eating the bark of the fruit trees. One of the best preventive methods is to wrap newspapers loosely around the trunks of the trees. They can be kept in position with string or wire.

Sheep Breeding.

ADDRESS BY MR. H. KELLY, OF SOUTH AUSTRALIA, AT THE AGRICULTURAL BUREAU STATE CONFERENCE.

THE principle that like begets like is the most generally accepted theory of breeding. There are exceptions to this rule, but generally speaking it is a sound basis on which to work. If one consistently culls from his dams, inferior animals, and chooses for sires those showing prominently the characters he requires, he must substantially improve his flock.

Choosing the Sire.

When choosing a sire, it is always wise to buy him as nearly as possible in a natural condition. Many young rams are so artificially forced that their development appears abnormal; but often this rate of development does not continue. The mistake is often made of buying, at shows, precocious youngsters whose development is the result of extreme forcing. If the beginner in sheep breeding can attain a critical eye for points of frame, constitution, and style of carriage, and distinguish between fat and flesh, he will soon know how to choose a sire to improve his flock.

Perfect animals are seldom bred and less seldom bought, and as a consequence, in addition to breeding only from the best, it is important to recognise the value of corrective mating. Practically all animals have distinct faults; many have good points equally distinct. The art of breeding lies largely in judicious mating to correct faults and perpetuate good points. Only experience and close study will develop that instinct that enables a breeder, by corrective mating, to build up the type he requires.

As a general principle it must be insisted that the individual animal be strong in essential points, and that, no matter how well an animal may have been bred, it does not pay to use a mean specimen. Yet we must look keenly into the pedigree; learn to examine a pedigree carefully, and see that there are no weak links, particularly in the first two generations. While the importance of length of pedigree can easily be over-estimated, it is vitally important to find out all one can about parents and grand parents of a sire. The extent of prepotency, or ability to transmit his good qualities, can be gauged largely by a look into his ancestry.

The Merits of In-breeding.

The question of in-breeding or breeding between close relations has always been a fruitful field for controversy. Many urge that there is no surer way to ruin a stud; yet it is an established fact that many of the greatest improvements to stock have been due to in-breeding. What is to be gained by in-breeding? By this means outside factors are excluded, and the qualities of the parents are more truly represented in the offspring. In-breeding tends to reduce the amount of variation due to the re-combination of

characters, and thus to fixity of type. Therefore, if a breeder obtains an animal of strong constitution and possessing most of the good points required, and shows no serious faults, he will be well advised to mate that animal to those of its relatives of like good qualities, particularly if strong in the points in which the sire inclines to weakness. It is certain that if a breeder definitely refuses to mate close relations under any circumstances, he will sacrifice the opportunity to produce and establish a better type of sheep.

There are two dangers of in-breeding; one is that if it is indulged in to any great extent the offspring is inclined to be lacking in vigour and also inclined to be sterile; the other danger is that if a ewe and a ram are closely related and have the same fault, the tendency is to emphasise this fault in their progeny.

These factors must be studied long before mating, and the breeder should know on which general line he intends to work before he goes near his yards. Each ewe, of course, must be examined individually and mated to that ram which will be most likely to transmit her good points as well as correct her faults. It will be found worth while to have the record books of the studs handy while classifying the sheep. It is very useful to know whether a certain ewe threw a good lamb to such and such a ram last year, or whether the offspring was culled.

The condition of the rams and ewes at mating time is worthy of consideration. The rams should be in healthy condition, but certainly not flabby fat, and should not be forced just before joining with the ewes. It is better to keep the rams in good condition all the year round than to keep them poor for most of the year and then have to force them for the last month. The same applies to the ewes: fat and thin ewes are less likely to take the ram, and if they do, they are hard to get in lamb.

The Advantages of Hand-serving.

If your ewes are running with the rams in the usual way, forty to a ram is as much as is usually safe. The ewes should be yarded often; our practice was to yard every other night. For the past two years, however, we have changed over to hand-serving, which has the following advantages over the other method:—

1. A ram can serve up to 200 ewes; by increasing the number of ewes a ram will serve you automatically increase the value of your ram.

2. You can use an old ram.

3. You can use a ram that you want for next year's show without letting him go back much.

4. You can be sure that every ewe on heat gets served.

5. You know if a ram is not getting his ewes by the number that come back.

6. You know for certain which of your ewes are in lamb.

Hand-serving is not as much understood as it should be. The rams and the teasers are kept in the yards and are well fed; the rams should have a dose of one tablespoonful of Epsom salts once or twice a week to keep them healthy. I use five teasers to 100 ewes, and do not think it makes any difference whether a teaser is a poor ram or not.

The ewes are brought in each morning before it gets too hot, and the teasers are left in with the ewes. Any ewes that are on heat are put in with the ram they are branded to, and after service, raddled, say down the left shoulder and put into the next paddock. This goes on for sixteen days, and then the two flocks are mixed and the process repeated. Any ewes that have not come back after being served in the first sixteen days may be taken as in lamb, and turned out into another paddock. Any that come back simply stop in the flock until they do not come back.

The only trouble we experience is that about 5 per cent. of ewes do not come on.

Points on the Care of Ewes and Lambs.

After mating the ewes should be kept on fair feed, but not allowed to get too fat, and should have access to as much medicated salt lick as they will eat. Our ewes lamb in the beginning of April, which is the middle of our autumn. They are always in from the back paddocks by 1st March, and are fed with silage if there is not enough green feed.

As the ewes lamb they are shifted through on to the next paddock, the lambs being "ringed" and the breeding entered as they go through. It is important that pedigrees be entered up in the stud book soon after ringing, because there is always the possibility that the shed book will get left in the rain, or mislaid.

The ewes with lambs must be hand-fed if there is no green feed. A ewe that has lost a lamb can always be made to take another, if she is shut up with it long enough. Tying the skin of the dead lamb over an older lamb is very helpful. If a lamb gets left in the cold soon after it is born, and it is too weak to stand, it can often be brought round if enough care is taken. It should always be fed on ewes' milk whenever possible. Do not try to give it too much at a time, as it is liable to choke. Keep it warm but not too hot. An orphan lamb should not be given new cow's milk; half milk and half water is suitable to start with, and later a change-over can be made to three-quarters skim and one-quarter new.

It is best to tail when the lamb is a fortnight old. We use pinches in tailing the pure-breds, but for the cross-breds we simply use a knife; the lambs are always in the yards the night before. The tails should be looked over two days later and any ugly scabs pulled off.

On a lot of properties foxes consume a lot of the profits. Each man has his own way; I simply poison birds and singe them. The baits should be laid early in the season.

As the lambs grow up do not lose interest in them. Get to know the mothers of good and poor lambs; you should always know the mothers of your stud rams. Also, notice any lambs that are having a hard time; many

a good stud ram has been sold out as a flock animal because he was a little backward at picking out time. Also, weigh your best lambs fairly often; it serves as a basis of comparison with other lambs and also tends to stress the value of early maturity, which is essential in British breeds.

When picking out your stud rams as distinct from the flock rams, go about it carefully. Pick out the obvious flock rams first, and then pick out the best from the remainder. Remember that a sheep not true to type will never be true, but a ram which shows no particular strength and no particular weakness will often grow into a good even sheep; so select your rams generously.

Drenching Sheep for Stomach Worms is most Effective.

Some misconception appears to have been created by reports on papers read at the recent meeting of the Australian Veterinary Association at Canberra in connection with parasitism in sheep, writes Mr. Max Henry, Chief Veterinary Surgeon. The impression appears to have been created that drenching is useless. It would be regrettable if such an idea were to obtain widespread belief. It is true that in the case of the small intestinal worms the effect of drenching is much below what one might desire and the question of the feed supply is of paramount importance, as indeed it is with all types of parasites. But against the stomach worm, which has been the cause of such serious economic loss to this State, drenching is most effective, particularly if carried out early and repeated as occasion demands. Where sheep are invaded with a mixture of parasites, as is usually the case, even though drenching may not be effective against all of them, yet to relieve the sheep of some types will in itself help them the better to resist those which are not affected by the drench. It will be seen, therefore, that a good deal depends on determining just what parasites are of particular importance in any given flock.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1933.

Mullumbimby (M. Flint) ...	... Nov. 15, 16

1934.

Dapto	... Jan. 9, 10	Maitland (Montie Brown)...	... Feb., 28, Mar. 1, 2, 3
Albion Park...	... ,, 16, 17	Moss Vale (H. Richardson)	... Mar. 1, 2, 3
Kiama	... ,, 24, 25, 26	Queanbeyan	... ,, 2, 3
Berry	... ,, 30, 31	Muswellbrook (R. C. Sawkins)	... ,, 14, 15, 16
Wollongong	... Feb. 5, 6, 7	Goulburn	... ,, 15, 16, 17
Nowra	... ,, 12, 13, 14	Gloucester	... ,, 20, 21
Inverell (E. A. Clarke) ...	... ,, 20, 21, 22	Mudgee (T. P. Gallagher)...	... ,, 20, 21, 22
Newcastle (P. G. Legse) ...	... ,, 21 to 24	Gunnedah (Reg. A. Brown)	... April 10, 11, 12
Gunning (G. E. Ardill) ...	... ,, 22, 23, 24	Kempsey	... ,, 11, 12, 13
Yass (S. C. Sleeman) ...	... ,, 27, 28	Dungog (W. H Green) ...	... ,, 19, 20, 21
Moruya (H. P. Jeffrey) ...	... ,, 27, 28	Gresford (A. R. Brown) ...	... ,, 27, 28

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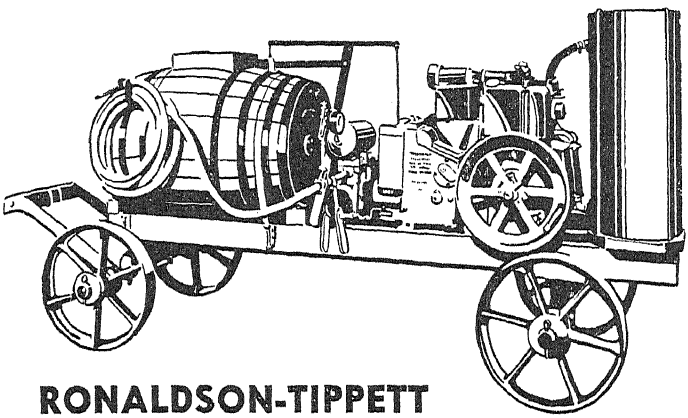

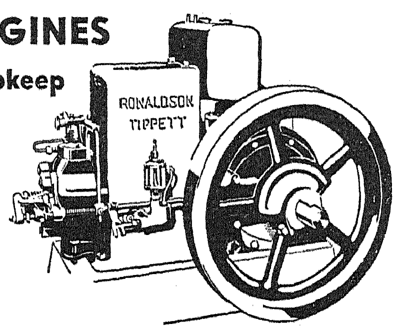
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Agricultural Gazette of New South Wales.

A Charcoal Gas Plant.

Making Tractor Farming More Economical.

H. H. ANDREWS, H.D.A., Agricultural Instructor.

The utilisation of gas produced from charcoal, instead of the much more costly kerosene or petrol, has been claiming the attention of farmers and inventors for some time. The use of charcoal gas for stationary plants is not new, but it is only within recent years that its possibilities from the point of view of tractor farming have been demonstrated.

The author of this article is indebted to Mr. E. H. Hamilton, of French Park, for the details of construction given below. Messrs. Hamilton and J. Currie (also of French Park) hold patent rights over the plant described, but have generously offered to allow any *bona fide* farmer to make one (*and one only*), provided it is solely for his own use. Farmers wishing to avail themselves of this offer should communicate with the patentees and obtain their permission in writing. Don't fail to include a stamped and addressed envelope for reply.

Tractors equipped with charcoal gas plants are now giving excellent performances, and since these plants are very cheaply made, easily installed and make the tractors extraordinarily cheap to run (in addition to the low cost of charcoal as fuel, the lubricating costs are reduced at least 50 per cent.), farmers who desire to keep down their cropping costs may be interested in details of the construction and installation of the plants.

A number of the fittings required will already be available as waste material on most farms where tractors are used, and this applies particularly to the drums,* of which the following are necessary:—

One 44-gallon steel petrol drum (A).

One 44-gallon iron kerosene drum (B).

Two 5-gallon boiled oil drums (C and D).

Two 12-gallon lubricating oil drums (E and X).

The accompanying diagrams illustrate the method of constructing the plant. The drums are placed on special platforms built on the engine to suit the operator and also the class of tractor used; the length of piping also depends on the spacing of the drums.

The Fire Box.

An oval piece 4 inches wide by 3 inches deep is cut out of the sides of the drums X (12-gallon oil drum) and A (44-gallon steel petrol drum), at the front, the lower edges of the openings being 1 inch above the bottom of the

* In the accompanying diagrams the drums are lettered A, B, C, D, E and X, respectively.

drums. These are the openings of the fire hole to enable clinkers, etc., to be removed. The hole in drum A is covered by two pieces of ¼-inch plate, one inside and one outside the drum, and drawn together by a butterfly nut on a stud running through both plates. This is to prevent any fire coming out of the firebox. A cut is also made in the top of drum A, the diameter of the cut being smaller than that of drum C (5-gallon boiled oil drum), to enable the subsequent fitting of C.

The bottom of drum X is now cut to enable an ordinary fire grate, 11½ inches by 9½ inches, to be fitted. The cut is made smaller than the grate to allow of the edges being drawn round the grate to hold it in position. This grate and its fittings will not burn out because of the steam from the water in drum B.

A circular cut is then made in the bottom of A, the diameter being 1⅛ inches less than the diameter of the bottom of drum X, and the edges bent out to allow drum X (with the top removed) to be inserted into A. The edges of the bottom of A are then turned under X (see diagram) to hold it securely in position, care being taken that the holes in the sides of X and A are directly opposite each other.

The cavity between X and A is filled with firebrick, or clay which will act similarly, a piece of iron cut from one of the drums being used as an arch over and between the oval fire holes in the sides of A and X to allow of the setting of the material without interfering with the firehole, the arch to be sufficiently wide to allow of movement of the inner plate. Care should be taken to see that the material placed in this cavity will hold together, as the side of drum X burns away, leaving the material against the fire. Experiments carried out at Merriwagga with pipeclay gathered from the refuse from bores, have led to the conclusion that two parts of pipeclay and one part of ashes mixed to a stiff paste with milk, will make a great fireclay. Tested in a forge the resultant fireclay appeared like glazed chinaware, with a solid ring when struck with a piece of iron.

A piece of flat iron 8 inches by 8 inches cut from the leavings when making the hole for X to fit into A, is bolted through the top of A in front of the gas outlet. This is to prevent, as much as possible, the flakes of charcoal, etc., getting into the outlet pipe.

Drum C, which is merely for the purpose of filling charcoal into the firebox is fitted in various ways, but the following is a simple method. The edges of the hole in the top of drum A are pushing upward, and C (which has the bottom removed) is placed neatly over the collar so formed, packing being inserted to make the joint airtight. To secure drum C in position, bolt about six pieces of strap iron from bales of bags to the top of drum A, spaced around C, and lip the ends over the top of drum C.

A circular piece is cut out of the top of drum C and another piece, of greater diameter, placed over the opening. This cover is held in position by a strap of flat iron, hinged on one side of drum C and fastened with a butterfly nut on the other (see diagram). The use of packing will ensure

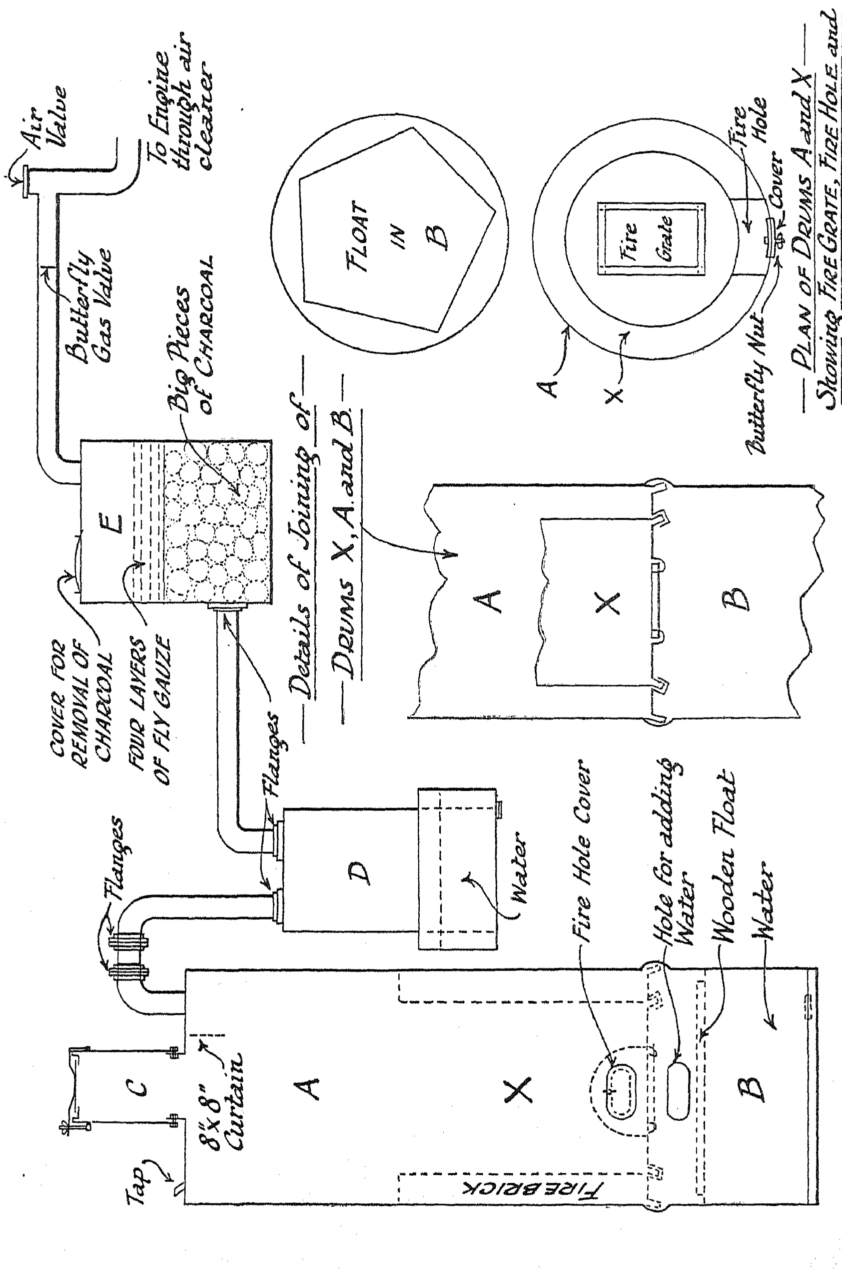
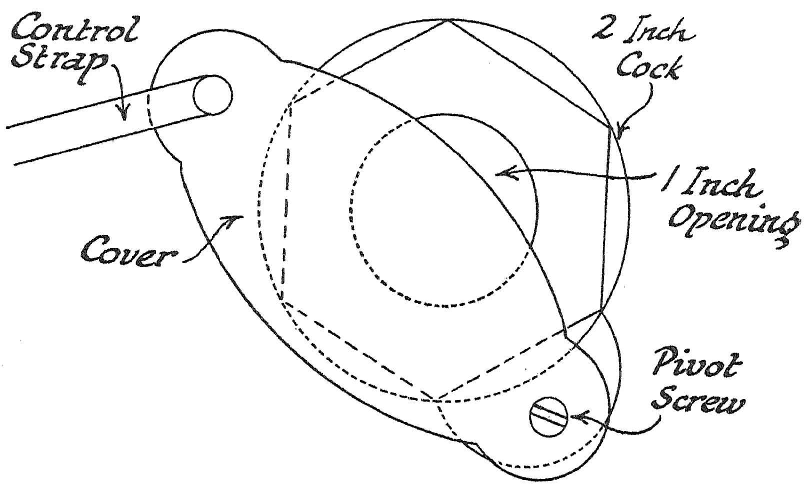


Diagram Showing General Layout of Charcoal Gas Plant for Tractors.

that the opening is gastight. Other simple methods of securing drum C in position and covering this opening will suggest themselves to practical farmers.

The drum B (an ordinary iron fuel drum) is cut off at the top of the first rib from the bottom, and a wooden float of 1-inch softwood is cut and placed in position (see diagram). The float is to prevent splashing and slopping of the water when the tractor is working. The edge at the top of drum B is then forced out as far as possible, and the drum A let in and bolted through B with six ½-inch bolts. The top of B is then hammered on to A. This makes a very good fitting joint. B has an oval hole, about 5 inches by 4 inches, cut in the front near the top to allow water to be poured in.



Details of Air Valve.

The gas leaves the fire box from the ordinary 2-inch screw hole in the drum A. Into this hole is screwed a piece of 2-inch piping to take the gas to the first water cleaner. It will be found necessary to use two flanges to enable the correct bends to be made in the pipe.

The Water Cooler.

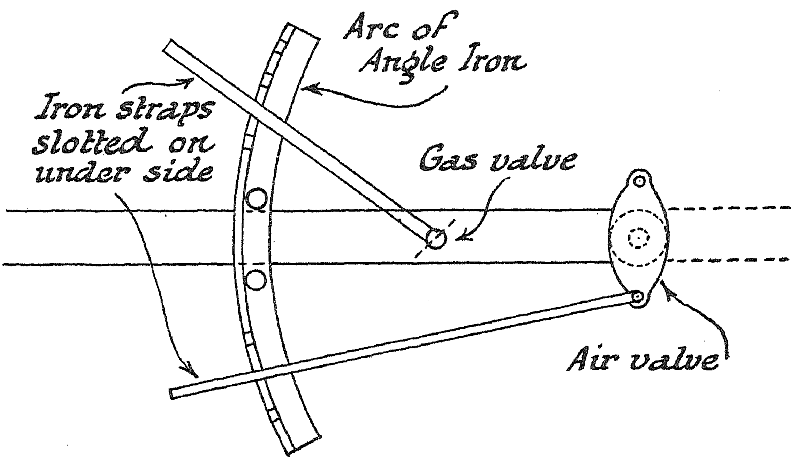
The drum D is an ordinary 5-gallon boiled oil drum, the bottom of which is removed, and it is stood in a portion (the lower 10 inches) of a 12-gallon oil drum, partly filled with water. D simply rests in the 12-gallon drum, which in turn rests on a platform built conveniently for it on or close to the engine. The position depends on the type of tractor and the space available between the furnace and the entry of the gas into the engine. The 12-gallon drum is filled at the opening between the two drums and emptied by the screw cock in the bottom.

The top of D is cut to allow the 2-inch pipe to enter the drum and also to allow the gas to be taken away to E. This will require two more 2-inch

flanges bolted on to D. The flanges can be made gas-tight with pieces of old felt hats. The gas does not go through the water, which acts as a cooler, and also catches any large pieces of grit, etc., coming from the fire-box.

A Dry Cleaner is Fitted.

The gas is then led through another 2-inch pipe to the dry cleaner E, which is a 12-gallon oil drum, about two-thirds filled with large lumps of charcoal—about 2-inch mesh. The gas enters near the bottom, another flange being used, and goes through the charcoal. On top of the charcoal four thicknesses of fly gauze are used to further screen or clean the gas, which is then taken away by another 2-inch pipe through the gas valve, past the air valve, and then to the air cleaner of the engine. Drum D has a hand hole at the top for cleaning, which must be done every week, the charcoal then being used in the fire box. This drum must be *gas-tight*.



Details of Controls for Gas and Air Valves.

Air and Gas Valves.

Once the gas has been through the dry cleaner, the procedure is more or less governed by the type of tractor. There must, however, be a butterfly valve in the pipe to allow the supply of gas to be regulated, and also an air valve to regulate the quantity of air. A simple type of air valve can be constructed as follows:—Secure a drum cock which has a smaller cock inside the larger one (see diagram). Remove the smaller cock and screw the larger one into the arm of the "T" piece to which the air valve is to be fitted. Such a cock has a lip with a small hole through it (for attaching addresses, etc.). Make a cover piece (of flat iron), somewhat oval in shape, and with a lip (to correspond with the lip on the cock) at each end, each lip having a small hole through it also. A bolt is now put through one lip of the cover and the lip on the cock. Movement of the cover on this pivot enables the size of the opening for the air to be regulated.

This movement is controlled by an iron strap, with a number of slots cut on the under size, and the adjustment of the butterfly valve gas regulator is made by a similar ⅛-inch iron strap on edge with slots ¼ inch apart on the under side. These iron straps are carried on an arc of angle iron about ⅛ inch thick, clamped across the pipe between the dry cleaner E and the valves (see diagram), several notches being cut near one end for regulating the gas, and others toward the other end for regulating the air.

Tractor Air Cleaner Adjustments.

On some types of tractor the air cleaner can be used as it is, for instance, the Fordson. The gas is taken right into the manifold, which in the McCormick Deering has to be altered somewhat. The main difficulty is to get the required volume of gas into the engine. On a Fordson, it is necessary to put a larger pipe leading from the air cleaner to the engine. On a Vickers Aussie, it is necessary to remove the venturine tube in the carburettor. The Case requires a special intake between the carburettor and the governing valve. The Ronaldson Tippet does away with the air cleaner. With a Hart-Parr, it is necessary to remove the horsehair from the engine air cleaner and to use four layers of fly gauze. With a McCormick Deering, remove three of the bundles of steel wool in the air cleaner and tease out the remaining two bundles; a little experimenting will soon allow the operator to obtain best results.

Points in Operation.

Those farmers who use the gas plant all claim that with the addition of about 2 gallons of fuel per day the load pulled before installing a plant can still be pulled as easily. If this is correct, and I believe it is, the plant becomes as effective as the fuel-drawn plant.

There are a few points worth watching:—

1. All joints must be kept gas-tight—particularly the dry cleaner.
2. Use only good, clean, screened charcoal.
3. Clean the dry cleaner every week when working.
4. Take out the small tap in drum A when the tractor is stopped overnight. This will keep the fire alight.
5. This plant does not affect the ordinary fuel attachments, which can be used in conjunction, or separately.
6. The tractor can be efficiently used for light jobs, such as pumping and grading, which formerly were considered too expensive with fuel.
7. It is necessary to start the tractor on petrol to start gas drawing through. Half a pint is usually sufficient, if the fire is going well.
8. Use any old material available on the farm for parts, thus cutting down expenses. A Hart-Parr fitted at Griffith cost £3 2s. 6d. for parts, and a Ronaldson Tippet a similar amount.

Varieties of Wheat, Oats and Barley.

DEPARTMENTAL RECOMMENDATIONS FOR DIFFERENT DISTRICTS.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

THE following are the latest recommendations as to the varieties of wheat, oats, and barley best suited to various portions of the State. Growers are advised to make early arrangements for supply of seed, and if in doubt as to which variety to sow they should communicate with the Department of Agriculture.

WHEAT.

Coastal Districts.

(Embracing districts which are specially subject to rust.)

For Hay—

Gresley, Florence, Firbank, Clarendon (early maturing varieties).

For Green Fodder—

Gresley, Florence, Firbank, Clarendon (early maturing varieties).

Northern Tableland.

(Of which Glen Innes and Armidale are representative.)

For Grain or Hay—

Ford (mid-season sowing);
Clarendon (late sowing).

Central Tableland.

(Of which Bathurst is representative.)

For Grain or Hay—

Canimbla (early and mid-season sowing);
Cleveland (early and mid-season sowing);
Ford (mid-season sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

Southern Tableland.

(Of which the Monaro, Crookwell, Batlow, and the Federal Territory are representative.)

For Grain or Hay—

Ford (mid-season sowing);
Waratah (mid-season and late sowing).

South-western Slopes, Eastern and Central Riverina.

(Of which Wagga, Temora, Wyalong, Barellan, and Narrandera are representative.)

For Grain or Hay—

Yandilla King (early sowing);
Turvey (early sowing);
Penny (early sowing);
Marshall's No. 3 (early sowing for more favoured districts such as Henty, Junee, and Young);
Ford (mid-season sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

For Grain only—

Free Gallipoli (early and mid-season sowing);
Baringa (early and mid-season sowing) for drier districts;
Dundee (mid-season sowing);
Bobin (mid-season and late sowing).

For Grain on Mallee Soils—

Currawa (early sowing);
Penny (early sowing);
Nabawa (mid-season sowing);
Bobin (mid-season sowing).

For Hay only—

Zealand (early sowing);
Gresley (mid-season sowing);
Baroota Wonder (mid-season sowing).

South-western Plains and Western Riverina.

(Of which Deniliquin, Cargelligo, and Hillston are representative.)

For Grain or Hay—

Nabawa (mid-season sowing);
Gresley (mid-season sowing);
Rajah (mid-season sowing).

For Grain only—

Free Gallipoli (early sowing);
Bobin (mid-season sowing);
Duri (mid-season and late sowing).

For Grain on Mallee Soils—

Currawa (early sowing);
Penny (early sowing);
Nabawa (mid-season sowing);
Bobin (mid-season sowing)

Central-western Slopes.

(Of which Dubbo, Narromine, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative.)

For Grain or Hay—

Canimbla (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Turvey (early and mid-season sowing);
Penny (early and mid-season sowing);
Ford (early and mid-season sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing);
Riverina (late sowing).

For Grain only—

Dundee (mid-season sowing);
Bobin (mid-season sowing);
Duri (mid-season and late sowing).

North-western Slopes.

(Of which Tamworth, Gunnedah, and Coonabarabran are representative.)

For Grain or Hay—

Cleveland (early sowing), especially suitable for the cooler portions of this district, such as Inverell, Delungra and Coonabarabran;
Marshall's No. 3 (early sowing);
Ford (early sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing);
Clarendon (late sowing).

For Grain only—

Currawa (early sowing);
Canimbla (early sowing);
Aussie (mid-season and late sowing);
Duri (mid-season and late sowing).

Western Plains.

(Of which Trangie and Condobolin are representative.)

For Grain or Hay—

Nabawa (early sowing);
Riverina (mid-season and late sowing).

For Grain only—

Bobin (early and mid-season sowing);

For Hay only—

Baroota Wonder (early sowing).

Murrumbidgee Irrigation Area.

For Grain or Hay on the Irrigated Areas—

Marshall's No. 3 (early sowing);
Yandilla King (early sowing);
Ford (mid-season sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

For Grain only on the Irrigated Areas—

Free Gallipoli (early and mid-season sowing);
Bobin (mid-season sowing).

For Hay only on the Irrigated Areas—

Zealand (early sowing);
Gresley (mid-season and late sowing).

OATS.

Varieties Recommended.

The varieties recommended by the Department for the various portions of the State are as follows:—

North Coast.—Algerian (for grazing), Sunrise, Buddah.

South Coast.—Algerian, Sunrise, Mulga, Buddah.

Central Tableland.—White Tartarian (for spring sowing in colder parts), Algerian.

Northern Tableland.—White Tartarian (for spring sowing), Algerian.

Southern Tableland and Monaro.—White Tartarian (for spring sowing in colder parts), Algerian.

South-western Slopes and Riverina.—Algerian, Belar, Mulga, Gidgee, Palestine.

Central-western Slopes.—Algerian, Belar, Mulga, Buddah, Gidgee, Palestine.

North-western Slopes.—Algerian, Guyra, Belar, Mulga, Buddah.

Under Irrigation.—Algerian, Guyra, Belar, Buddah.

Western Plains.—Sunrise, Gidgee, Mulga, Buddah, Palestine.

BARLEY.

The varieties recommended by the Department are:—

Two-row type (commonly called "malting barleys").—Pryor.

Six-row type (commonly called "feed barleys").—Skinless for early winter green feed. Cape and Trabut for green fodder and grain.

PURE SEED SUPPLY.

In each issue of this *Gazette* is published a list showing where pure seed of the various varieties recommended to farmers may be obtained. These supplies come either from the Department's experiment farms or from reliable farmers in different districts who are concentrating on the selection and improvement of varieties, which are kept pure and maintained or improved in yielding capacity.

"Purple Patch" of Wheat and Oats.

A Disease Caused by the Fungus *Rhizoctonia solani.*

H. J. HYNES, M.Sc., B.Sc.Agr., Senior Assistant Biologist.

Of all the parasitic fungi responsible for diseases in cereal crops in New South Wales, the most important are those which inhabit the soil and confine their attack to the basal regions of the plants. Thus, the root-rot diseases, take-all, foot-rot, and fusarium blight have long been recognised as three of the most serious maladies of wheat in this State, and, until recently, were considered to be the only root-rot diseases of any consequence in our wheat-growing areas.

Of late years, however, the attention of the Department has been directed to a new type of root injury in cereals, restricted in its occurrence to a section of the south-western slopes. Owing to the manner of its appearance

A Purple Patch Area in a Wheat Crop.
The photograph was taken in August.
[*Photo by W. D. Kerle.*

and the nature of affected plants, the popular name "purple patch" was adopted for the disease when it first appeared some few years ago. More recently it has been established, as indicated below, that the causal agent is a parasitic fungus, *Rhizoctonia solani.*

The disease occurs in both wheat and oats, and numerous instances of severe damage to these crops have come under notice in certain seasons. The yield from affected patches is usually negligible owing to the heavy inroads of disease in the winter months resulting in death of most of the

plants. Sometimes, however, partial recovery of affected plants takes place with the advent of warmer weather, and this is usually more pronounced in oats than in wheat.

Healthy and Purple Patch Plants (Collected in July).

From Left.—Healthy oats ; diseased oats ; healthy wheat ; diseased wheat.

[*Photo by P. R. Maguire.*

Messrs. Geoffrey Samuel and S. D. Garrett,* of the Waite Agricultural Research Institute, South Australia, in a paper published last year, draw attention to what appears to be the first definite record of *Rhizoctonia*

* Geoffrey Samuel and S. D. Garrett—"*Rhizoctonia solani* on cereals in South Australia;" *Phytopathology,* 22: 827–836; 1932.

solani causing a disease of cereals under field conditions. From the description of symptoms and illustrations given in their paper it is concluded that the disease occurring in South Australia is the same as that known as "purple patch" in this State.

Symptoms of "Purple Patch."

The first indication of the disease is the appearance of unhealthy patches throughout the crop within three months of sowing. These patches vary in shape and size from small, almost circular, areas of about a foot in diameter to large, irregular areas covering three-quarters of an acre or more. Viewed from a distance, the unhealthy patches present a slightly purplish appearance, particularly in the case of oats.

Individual affected plants of both wheat and oats appear stunted, stiff and erect, with pronounced yellowing and purpling of lower leaves. Examination of the root-system shows extensive brownish discolouration and rotting of both primary and secondary roots, leaving, in most cases, only a few rotted stubs in the place of the latter.

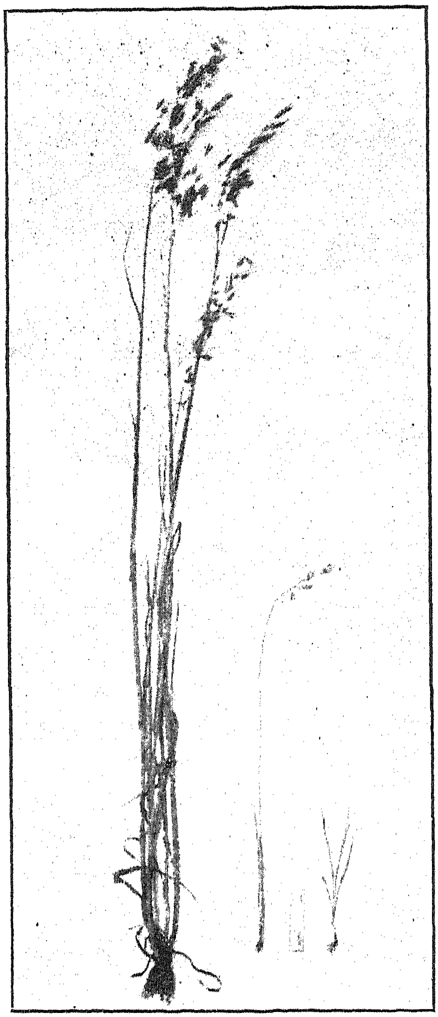
Many affected plants succumb after reaching a height of only 2 to 5 inches, while others continue to make poor growth, and eventually produce one head per plant, and this is of decidedly inferior quality. It has been frequently noticed that some patches which show the disease in severe form in July make recovery in the spring months, so that when the healthy portion of the crop is ripening these recovered patches stand out as thin, green areas, the maturity of which is delayed as a result of parasitic attack early in the season.

The Causal Fungus.

For some time the cause of purple patch was unknown. In attempting to isolate a parasitic organism from affected plants taken from the field in July or August, it was found that not one, but several different fungi consistently appeared in the isolation tests, hence little importance was attached at the outset of the investigation to the possible role of any one of the organisms obtained from diseased roots.

Inoculation tests conducted in August-September last, however, using the fungus *Rhizoctonia solani* isolated from affected plants of wheat and oats in July, demonstrated beyond doubt that this organism *per se* is capable of causing in both wheats and oats symptoms which agree with those observed on purple patch plants in the field. An additional, more comprehensive experiment confirmed the findings of the preliminary inoculation test, and showed, moreover, that the fungus can attack not only wheat and oats, but also barley and rye with equal severity. The disease also occurs on black oats, and it is quite probable that native grasses found on wheat land are likewise quite susceptible to attack.

It is of interest to note that *Rhizoctonia solani* has also been found responsible for a condition in turf known as "brown patch," a disease which has been observed on several occasions in golf and bowling greens in various parts of the State.



Healthy and Purple Patch Oats (Collected in November).

Left.—Healthy plant. *Centre.*—Plant from partly recovered patch. *Right.*—Badly affected plant.

[*Photo by P. R. Maguire.*

The fungus *Rhizoctonia solani* is a common inhabitant of arable land, and has a very wide host range. It is responsible for the well-known potato disease, black scurf, and in the tests conducted in September last it was conclusively shown that the strain of the fungus causing purple patch and that causing black scurf are not only similar in general appearance, but can each cause the same severe effects on potato shoots and cereals.

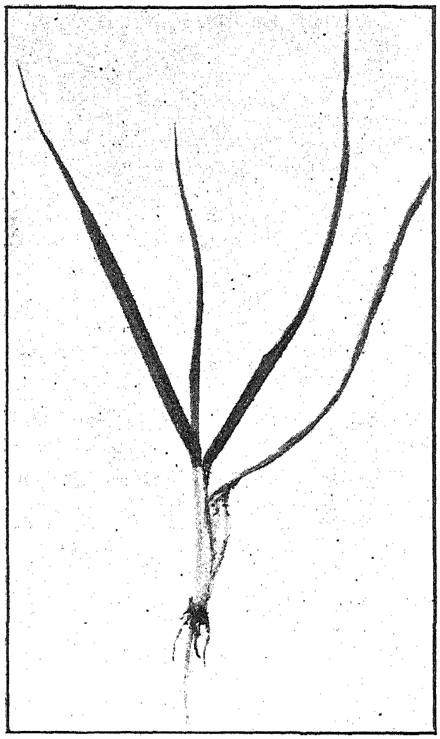
In preliminary tests it has been found that the purple patch organism makes most vigorous growth at low temperatures, and this explains, no doubt, why the disease is most severe during the winter months. The fungus lives over from year to year in the soil on diseased roots and other decaying organic matter, and its resistance to the effects of extremes of temperature and moisture is rendered possible by the formation of small, dark-brown resting bodies which, under favourable conditions, germinate and bring about infection.

Control of the Disease.

Cultural Practices.—While purple patch occurs in wheat and oats grown on both fallowed and unfallowed ground, it has been observed that more severe effects result from sowing on stubble land than on fallow; also, fallowed land poorly worked shows more disease than similar land cultivated several times. Even though purple patch may appear fairly widespread early on a well-worked area, recovery in the spring is much more likely on such land than on poorly-prepared areas. There is also evidence to support the

statement that the disease is somewhat more severe in crops sown late than in those planted early; no varieties have been noticed to show resistance to attack.

Dressings with Fertilisers.—In recent years a considerable amount of attention has been paid to the possibility of controlling purple patch by dressing affected areas with various chemicals, and several experiments in this regard have been conducted on farmers' properties and in the Biological Branch glasshouse. It is not proposed to detail the work in this brief article, but it may be stated that substances such as sulphate of ammonia, magnesium sulphate, manganese sulphate, ferrous sulphate, sulphate of potash, lime, farmyard manure, etc., have been tested, and very encouraging results in control have been obtained by the use of lime and/or sulphate of ammonia, beneficial effects being more quickly obtained with the latter than the former.



Oat Seedling affected with Purple Patch.
Note stiff, erect nature of leaves, and rotted secondary roots.
[*Photo by P. R. Maguire.*

Pot experimental work on a comprehensive scale has shown that treatment of affected soil with sulphate of ammonia at the rate of 1 cwt. per acre prior to sowing gives good control of purple patch in wheat. No benefit resulted from the use of lime until the second season after treatment, when the degree of control obtained was quite as marked as in the original sulphate of ammonia treatments.

Field experiments involving dressings of wheat and oat patches about one month before planting have shown that sulphate of ammonia and/or lime give slight control of the disease in wheat, while in oats excellent results were obtained from the treatments with sulphate of ammonia; dressings applied in the winter, subsequent to the appearance of the disease, have also indicated that sulphate of ammonia stimulates growth. Further tests are in progress.

As more work is completed on control experiments the results will be made available to growers; in the meantime it should be noted that while dressings of sulphate of ammonia to crop areas on a large scale are not recommended, this fertiliser may, with advantage, be broadcasted on purple patch areas either before planting or when the disease subsequently develops in the winter months.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—

Fitzroy ... ... Manager, Experiment Farm, Grafton.
Funk's Yellow Dent ... J. A. L. Thompson, "Deep Water," South Gundagai.
Golden Beauty ... ... W. R. Mitchell, Lower Towamba, via Eden.
Ulmarra Whitecap ... J. Flanders, Ulmarra.
Wellingrove ... ... Manager, New England Experiment Farm, Glen Innes.

Sorghum—

Cowper ... ... Principal, Hawkesbury Agricultural College, Richmond.
Oxley ... ... Manager, New England Experiment Farm, Glen Innes.
Saccaline ... ... F. J. D. Doust, Lynn Farm, Camden.
White African ... ... Manager, Wollongbar Experiment Farm, Lismore.
Manager, Experiment Farm, Grafton.

Potato ("Certified" and "Standard" Seed)—

Carman ... ... Secretary, Potato Growers' Association, Millthorpe.
Early Carman ... ... Secretary, Potato Growers' Association, Millthorpe.
Early Manhattan ... Secretary, Potato Growers' Association, Millthorpe.
Secretary, Potato Section, Rural Co-operative Society Ltd., Orange (certified seed only).
Factor ... ... Secretary, Potato Growers' Association, Millthorpe.
Secretary, Potato Section, Rural Co-operative Society Ltd., Orange (certified seed only).
Secretary, Potato Growers' Association, Taralga.
Late Manhattan ... Secretary, Potato Section, Rural Co-operative Society Ltd., Orange.

Cucumber—

Early Fortune ... ... W. Parry, Terrigal.
Crystal Apple ... ... E. F. Ritter, Wyong.

Beans—

Tweed Wonder ... ... Superintendent, Riverina Welfare Farm, Yanco.

Tomato—

Improved Sunnybrook Earliana ... ... A. Sorby, Macquarie Fields.
Break-o'-Day ... ... A. Sorby, Macquarie Fields.
Manager, Experiment Farm, Bathurst.
W. Robinson, Boambee, Coff's Harbour.

Tomato—continued.

Bonny Best ...	... W. Robinson, Boambee, Coff's Harbour.
	Manager, Experiment Farm, Bathurst.
	P. Morandini, "Riviera," Bunglegumbie-road, Dubbo.
Marglobe ...	... Manager, Experiment Farm, Bathurst.
Norton	... Manager, Experiment Farm, Bathurst.
Mahona	... W. Robinson, Boambee, Coff's Harbour.

Sweet Potato (rooted cuttings)—

Porto Rico ...	... S. Redgrove, "Sandhill," Branxton.
	Superintendent, Narara Viticultural Nursery, Gosford.
Nancy Hall ...	... S. Redgrove, "Sandhill," Branxton.
	Superintendent, Narara Viticultural Nursery, Gosford.
Southern Queen	... S. Redgrove, "Sandhill," Branxton.
	Superintendent, Narara Viticultural Nursery, Gosford.
Ashburn	... S. Redgrove, "Sandhill," Branxton.
	Superintendent, Narara Viticultural Nursery, Gostord.
Wannop	... S. Redgrove, "Sandhill," Branxton.
	Superintendent, Narara Viticultural Nursery, Gosford.
Pierson	... S. Redgrove, "Sandhill," Branxton.
	Superintendent, Narara Viticultural Nursery, Gosford.
Triumph	... Superintendent, Narara Viticultural Nursery, Gosford.
Yellow Strasburg	... Superintendent, Narara Viticultural Nursery, Gosford.
Vineless	... Superintendent, Narara Viticultural Nursery, Gosford.
Farmer's Special	... S. Redgrove, "Sandhill," Branxton.
Narrow Leaf Jersey	... S. Redgrove, "Sandbill," Branxton.

Asparagus—

Lady Washington	... Manager, Experiment Farm, Bathurst.

Melon—

Red Seeded Citron	... Principal, Hawkesbury Agricultural College, Richmond.

Squash—

Banana	... Principal, Hawkesbury Agricultural College, Richmond.
	C. J. Rowcliff, Old Dubbo Road, Dubbo.

Watermelon—

Angelo	... C. J. Rowcliff, Old Dubbo Road, Dubbo.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Applications Invited for the James Murphy Bursaries.

The Perpetual Trustee Company Limited, 33 Hunter-street, Sydney, is calling for applications for bursaries provided for by the estate of the late James Murphy. Subject to satisfactory candidates being available, there will probably be two bursaries tenable at the Sydney University, and three at Hawkesbury Agricultural College.

The allowance in respect of the bursaries to be awarded for students entering the University and residing at St. John's College is to be £70 per annum, together with University tuition fees chargeable, and for students entering Hawkesbury Agricultural College £40 per annum. The bursaries are available in accordance with the will, to "the sons of poor Roman Catholic parents who are unable, owing to want of means, to go to the University to learn agricultural science."

Further details can be obtained from the Trustee Company mentioned.

Nabawa by Far the Most Popular Wheat.

THE Government Statistician (Mr. T. Waites) has issued a statement showing the area sown with certain varieties of wheat in the 1932-33 season. The figures are based upon returns furnished by the growers, and the varieties specified were selected by officers of this Department.

In the table appended, the varieties have been arranged according to acreage sown, and the percentages of the principal varieties to the total area of wheat are shown.

It is interesting to note the change in popularity of wheat varieties sown since the last tabulation of this information, which related to the season 1929-30. In that year the order of preference and the proportion to the total area sown with the six principal varieties were as follow:—Waratah (18.8 per cent.), Federation (15.7 per cent.), Yandilla King (9.9 per cent.), Turvey (6.5 per cent.), Canberra (5.5 per cent.), and Nabawa (4.7 per cent.).

TABLE Showing Popularity of Wheat Varieties.

Variety of Wheat.	Area Sown.	Proportion to Total Wheat Area.	Variety of Wheat.	Area Sown.
	Acres.	Per cent.		Acres.
Nabawa	1,619,915	31·8	Gresley	24,118
Waratah	705,890	13·9	Gluyas Early	21,499
Yandilla King	433,807	8·5	Cleveland	20,747
Free Gallipoli	240,721	4·7	Duri	19,818
Federation	184,495	3·6	Rajah	18,852
Turvey	168,727	3·3	Florence	18,819
Marshall's No. 3	144,173	2·8	Bald Early	16,127
Bobin	131,387	2·6	Clarendon	14,089
Penny	130,682	2·6	Canimbla	9,194
Ford	125,291	2·5	Bomen	8,309
Ranee	123,769	2·4	Baroota Wonder ...	6,697
Bena	123,645	2·4	Minister	5,782
Canberra	91,263	1·8	Geeralying	4,719
Union	64,636	1·3	Gullen	3,746
Currawa	61,529	1·2	Dundee	3,587
Riverina	52,997	1·0	Firbank...	3,255
Pusa No. 4	51,890	1·0	Cadia	2,066
Hard Federation	49,544	1·0	Comeback	1,901
Aussie	45,201	0·9		
Wandilla	35,509	0·7	Other Varieties ...	214,921
Major	31,877	0·6		
Nizam	27,189	0·5		
Purple Straw	25,206	0·5	Interim Total ...	5,087,589

"THE AUSTRALIAN MUSEUM MAGAZINE."

THE farmer, of all toilers, is said to be in closest touch with nature. This being so, he should find much to hold his interest in *The Australian Museum Magazine*, issued quarterly by the trustees of that institution.

Articles of particular interest in the current issue include one on poisonous spiders, another on frogs and toads, and a third on household insect pests. There are a number of other articles that make interesting reading.

This magazine is copiously illustrated, and is always attractively got up.

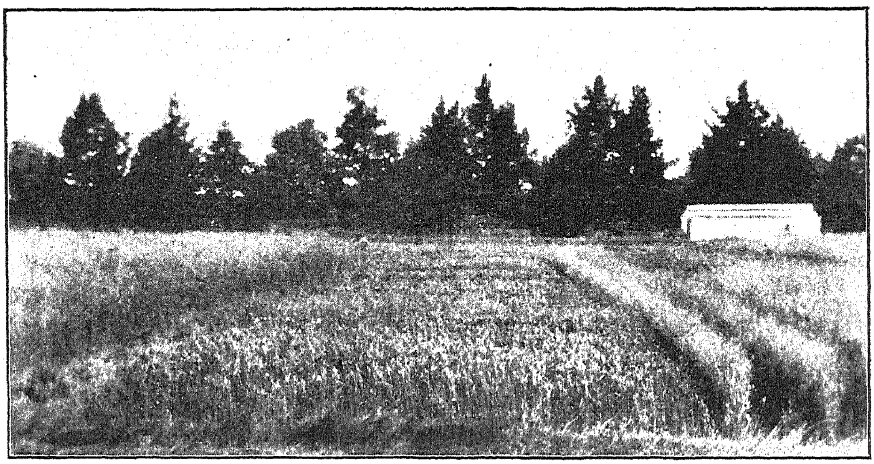
Leaf or Crown Rust of Oats.

FIELD OBSERVATIONS ON RESISTANCE OF VARIETIES.

S. L. MACINDOE, B.Sc.Agr., N. S. SHIRLOW, B.Sc.Agr., and
W. H. DARRAGH, B.Sc.Agr., Assistant Plant Breeders.

CROWN rust of oats has been recorded over a wide area of New South Wales, but although it is of economic significance on the tablelands it is of major importance only in coastal districts.

On the coast, oats are of considerable importance for supplying green feed for stock during the winter and early spring when there is likely to be a shortage of suitable pastures. Over 50,000 acres of oats are now grown annually for green fodder or hay on coastal dairy farms in this State.



Oat Rust Nursery at Glen Innes.
At either side are border rows of an early, rust-susceptible variety, which are inoculated with stem and crown rust.

This area represents a threefold increase in the area sown to oats during the past ten years and, with improvements in farming methods, a further increase in the area cropped to oats in coastal districts is to be expected. This increase in area has been rendered possible largely through the breeding of early, moderately crown rust resistant varieties such as Buddah and Sunrise. There is, however, also a place, especially on the North Coast, for later-maturing varieties, such as Algerian, which are suitable for continuous grazing or which can be used in conjunction with the earlier varieties to produce a succession of green feed during the winter and spring months.

The earliest record of the disease made by the Biologist of the Department was in 1890, and no earlier records are available from other States. That crown rust has been present and has caused considerable damage to coastal crops for many years is quite evident by reference to the reports of field officers of the Department (1) published since 1901 in the *Agricultural Gazette*, in which have been recorded the degree of damage from crown rust, the differential reaction of varieties to the disease and the progress made through the evolution of relatively resistant varieties such as Sunrise, Guyra, Mulga, and, especially, Buddah. It is evident from these records that when susceptible varieties are sown complete failures can be expected from this rust in some seasons under coastal conditions. In fact, no oat which has not a degree of resistance to crown rust can be recommended for coastal green fodder. At present all varieties in general cultivation suffer considerably from this disease under severe epidemic conditions such as are likely to be experienced during a warm, moist spring.

On the Northern Tableland, winter and spring grazing oats are not liable to be attacked by crown rust, which does not make its appearance till the warmer weather of late spring and summer. The quality of hay from these areas is, however, occasionally considerably reduced through the rustiness of the flag. Spring-sown hay crops which ripen during midsummer in this area are particularly liable to attack by crown rust.

The breeding of early and late oats which cannot be injured by crown rust in coastal districts, and of very late- or spring-sown hay oats for the tablelands is therefore a matter of some economic importance. It is on the tablelands also that stem rust is of major importance, so that oats resistant to both rusts and also to smuts are required to reduce risks of production and to increase yields in this area.

As seed of oats is seldom harvested on the coast it is essential that any variety intended for coastal districts must also be suitable for growing in the more western districts, from which seed is obtained.

The Crown Rust Fungus.

The organism causing leaf or crown rust of oats, *Puccinia coronata avenae*, is distinct from the fungus causing stem rust of oats, or stem rust or leaf rust of wheat. Crown rust occurs in the spring or summer and is restricted to the leaves, while stem rust occurs mostly on the stem and leaf sheafs and less frequently on the leaves. Crown rust is easily distinguished from stem rust when it occurs on the leaves, the pustules being light reddish yellow in colour, small, and isolated, whereas the darker red pustules of stem rust are larger and elongated, and in susceptible varieties, severely rupture the epidermis and may run together to form elongated lesions. Later in the season both rusts produce the black resting spores which, in the case of stem rust, occur in the large, open, elongated pustules, while the crown rust pustules occur as small round black spots on the leaves.

Under Australian conditions only the yellowish summer spores of crown rust are known to be responsible for the spread of the disease. In other

parts of the world this rust occurs on various species of *Rhamnus*, commonly known as buckthorn, which act as alternate hosts. Crown rust occurs, not only on the various species and varieties of *Avena*, but on a large number of grasses as well. Waterhouse ([2]) has tested the reaction of numerous grasses to Australian collections of *Puccinia coronata* and has found a number of these to be susceptible. Melhus *et al* ([3]) report the susceptibility of additional genera in America.

Different Forms of Crown Rust.

Numerous American workers have also shown that there are a number of physiologic forms of crown rust, and that varieties susceptible to one form may be resistant to others. Murphy ([4]), using some Australian varieties as differentials, distinguished nine different forms of crown rust in America. Waterhouse has not so far found any indication of physiologic specialisation of crown rust in Australia. It is not known to which, if any, of the American forms the Australian rust belongs.

As in the case of wheat rust, however, there seems to be some difference between the reaction of a variety to a given physiologic form as determined by its seedling reaction in the glasshouse and its behaviour under field conditions. Durrell and Parker ([5]) observed that "although the manifestations of resistance to rust in field and greenhouse are comparable, yet they are more marked in the field." The experience of American workers, verbally communicated to the senior author, was that a number of Australian varieties which under greenhouse conditions had a degree of resistance to some forms, increased in resistance to these and other forms under field conditions. Apparently there occurs also a type of "mature plant" or field resistance under Australian conditions, since varieties such as Bond and Buddah show no seedling resistance, although they have consistently shown moderately good resistance to crown rust under field conditions. In the field, data on resistance has been based on the number of pustules present rather than the type of pustule produced.

While it is possible that the crown rust form or forms present in Australia have varied somewhat, it is more probable that apparent differences in susceptibility of varieties in different seasons have been due chiefly to peculiar seasonal climatic conditions. Peterson ([6]) has shown that wide variations occur in the reaction of some varieties to crown rust when the plants are subjected to different temperatures. For instance Red Rust Proof (to which the Australian variety Algerian is very closely related) was susceptible to form 4 at 70 degrees Fahr. and 77 degrees Fahr., but resistant to it at 57 degrees. Popp ([10]) in Canada, found considerable variation in the seedling reaction of the variety Algerian to crown rust. The possibility of changes in rust resistance as a result of differences in the strains of the varieties used should also not be overlooked. Variations in disease reaction, as well as in other characters, have recently been found to be common in Australian oat varieties.

The lower temperatures, and especially the lower night temperatures experienced on the tablelands probably explain also the lower percentage of infection usually recorded for some varieties at Glen Innes as compared with coastal experiment farms. The fact that the relative resistance or susceptibility of varieties tested on coastal plots has not varied greatly over a thirty-year period, and agrees in general with the observations made on plant breeders' plots during the past four years, indicates that probably no considerable variation in the crown rust flora has occurred.

Field Resistance of Varieties to Crown Rust.

In a search for resistant varieties which might be of direct use or of value in breeding for resistance, several hundred varieties and fixed crossbreds have been observed for crown rust infection in breeding plots conducted at Grafton Experiment Farm on the North Coast, at Hawkesbury Agricultural College on the Central Coast, and at Glen Innes Experiment Farm on the Northern Tableland. At Glen Innes, for the past two years, special rust nursery conditions have been employed, but these have not been necessary on the coast.

Though observations have been made for four years, the recorded reaction of varieties in some cases is based on one year's observations only. The classification of varieties cannot therefore be considered final, although, unless otherwise stated, the precaution has been taken of not classifying varieties as resistant on the basis of observations made only at Glen Innes, where resistance is likely to be more pronounced than on the coast.

The method of making observations on varieties is similar to that used by the United States Department of Agriculture ([7]) with the local modifications enumerated by Macindoe ([8]). In recording crown rust it has only been necessary to use the percentage of infection, since pustule type does not appear to be of much value in indicating resistance to this rust. In this respect crown rust records differ from those of oat stem rust, in which the presence of resistant pustules is of great significance.

Rust Free (0 per cent.) Infection.

Avena strigosa strain.	Victoria x Richland (several).
Avena brevis strain.	White Russian, seln. W1950.
Victoria.	

These varieties only have been found to show complete field resistance to Australian crown rust. Although the strains of *A. strigosa* and *A. brevis* were rust-free under epidemic conditions in the years in which they were under observation, they were discarded without further testing because it was found to be impossible to cross them with the local varieties which are of the species *A. sterilis* and *A. sativa*. Waterhouse, however, found seedling resistance to Australian crown rust in the strain of *A. strigosa*, and also in the variety Victoria.

Victoria was originally introduced from Argentine by the United States Department of Agriculture and, through the courtesy of Mr. T. R. Stanton, Agronomist in charge of Oat Investigations of that Department, it was made available to Australian breeders. It appears to be

an epoch-making contribution towards the building up of crown rust resistant oats. Previous to its advent, no oat had been found to be completely resistant to all forms of crown rust in America. It has now maintained its immunity to crown rust for three years at each of the three centres at which it has been under observation in this State.

The strains of Victoria crossed by Richland were received late in 1932 as third generation seed from Dr. Murphy, of Iowa, U.S.A. They were sown late in the spring at Glen Innes only, and under fairly severe epidemic conditions, some lines appeared to be "fixed" for very high resistance to stem rust, inherited from the Richland parent, together with immunity to crown rust. A White Russian selection, W1950, also received from Dr. Murphy, and sown under similar conditions at Glen Innes only, also showed complete freedom from crown rust. A morphologically similar strain of the same variety, known locally as White Tartarian, was moderately heavily infected in adjacent rows, so that it is possible that yield-testing may prove the new strain to be of direct value as a crown rust resistant spring-sown oats for the Northern Tableland.

TRACE OR VERY LIGHT INFECTION (5 PER CENT.).

A. strigosa, strain A. 14.
A. brevis, strain A. 13.
Bond.

Bond is the only one of these varieties at present of importance from a breeding point of view. It is the result of a departmental cross between *A. sterilis* and Golden Rain. It is very late and is more suitable for grazing than for early green fodder. As it is probably too late for growing in western districts and is too susceptible to stem rust to be recommended on the tablelands, it is doubtful whether it will ever be of direct agronomic value on the coast. It is stated, however, to be a promising oat in the Southern and South-eastern States of America.*

LIGHT INFECTION (10 PER CENT.).

Buddah.
Spanish White.

While Spanish White is a valueless introduction, Buddah is now well known as a standard oat for early green fodder on the coast. Sunrise, with which it has to compete in this class, is not quite as resistant. Buddah is itself an early-maturing selection from Sunrise.

In addition, a number of fixed crossbreds or selections from other varieties belong to this group, but they need testing further for yield and disease resistance.

MODERATE INFECTION (25 PER CENT.).

Amery	Kherson
Baldwin	Myall
Dun	Westdale.

*Extract from Report of the Secretary of Agriculture, 1932, U.S. Department of Agriculture, page 27.

A number of other varieties and strains belong to this group, but they require further testing or are of interest only as parents in breeding.

HEAVY INFECTION (40 PER CENT.).

Alaska	Green's Ruakura
Algerian	Lampton
Asquith	Mulga
Beta	Red Rustproof
Belar	Rustless
Birdwood	Sunrise
Bombo	Woodford
Edkin	Victory.
Frazier	

This group includes the coastal varieties Algerian, Sunrise, Mulga, and Ruakura or Green's Ruakura. Although these varieties in most seasons show to advantage against more susceptible varieties, it is possible for them to be considerably reduced in yield in seasons which favour crown rust. While such varieties continue to be generally grown, the need for more highly resistant varieties is obvious.

VERY HEAVY INFECTION (65 PER CENT.).

Advocate	Kanota
Banner	Kendall
Barwon	Nebraska 21
Bradley	New Zealand Black
Brundah	Palestine
Gidgee	Radnorshire Sprig
Golden Rain	Richland
Gopher	Weston
Green Mountain	White Tartarian
Green Russian	Vrome.

None of these varieties can be recommended where crown rust is a menace. It is of interest that White Tartarian, in spite of its susceptibility to crown rust, continues to be grown on the Northern Tableland because of its resistance to stem rust. The highly stem rust resistant variety, Richland, is also quite susceptible to crown rust.

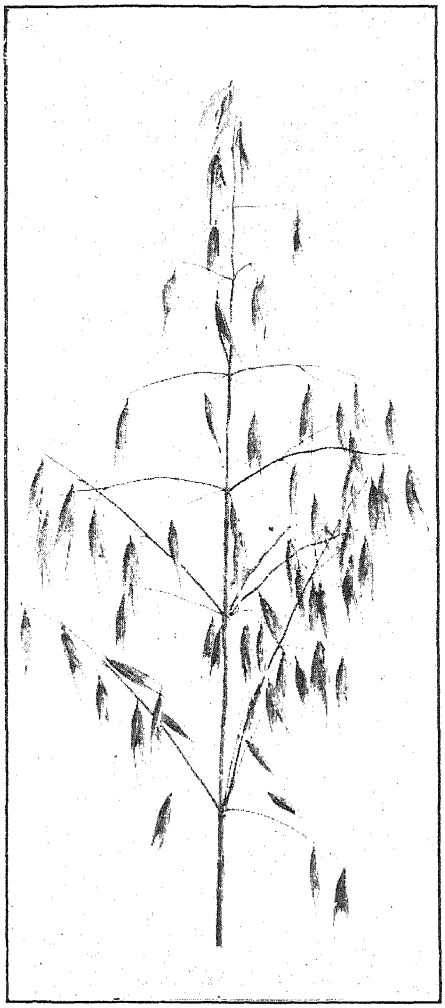
EXTRA HEAVY INFECTION (100 PER CENT).

Anthony	Fergusson Navarro
Black Nesdag	Fulghum
Boppy	Kareela
Boomi	Kelsall's
Budgery	Lachlan
Burke	Laggan
Burt	Markton.
Byng	

It will be noted that Laggan and Burke, which are very highly resistant to stem rust, are amongst the most susceptible varieties to crown rust.

Observations on stem rust published by Macindoe (9) together with unpublished data, indicate that there is apparently no association of resistance to leaf and stem rust. Actually varieties such as Victoria and Bond, which are resistant to crown rust, are amongst the most susceptible varieties to stem rust, while Richland, Laggan and Burke, which are very highly resistant to stem rust, are very susceptible to crown rust. Data, as yet

unpublished, also indicates that there is no association of resistance to smut with resistance to either rust. Nor does resistance or susceptibility to either rust appear to be restricted to any species, as members of both *A. sativa* and *A. sterilis* are represented in the "rust-free" or "trace" groups and in the "extra heavy infection" group. Murphy and Stanton ([11]) consider the oat



Panicle of Victoria.

Victoria to be a possible hybrid between *A. sativa* and *A. byzantina* (syn. *A. sterilis*), as it possesses some of the characters of both species.

Breeding Crown Rust Resistant Oats.

The preliminary testing of varieties suitable as crown rust resistant parents has now indicated Victoria, and to a lesser extent Bond, as the most suitable varieties to use in crossing. No named variety is available which

combines crown and stem rust resistance. In order to combine resistance to both rusts, Victoria, which is resistant to both crown rust and smut, has been crossed with Laggan, which is resistant to stem rust, but very susceptible to both the diseases to which Victoria is resistant. Victoria, though late maturing, has an attractive panicle, and is quite a desirable parent to use in crossing. Perhaps of even greater value will be the Victoria x Richland crossbreds from Dr. Murphy, of Iowa, some of which are apparently highly resistant to crown rust, stem rust, and smut. At Glen Innes, last summer, these were crossed with a number of varieties representing a wide range in type and maturity, such as Boppy, Sunrise, Belar, Laggan, Burke, Lampton, Algerian, Lee, White Tartarian, and Haver III.

Although progress has only just be commenced in the actual breeding of highly crown rust resistant varieties, it is believed that the work of producing oat varieties resistant not only to crown rust, but also to stem rust and smuts, is now on a thoroughly sound footing. The results of such work, however, cannot be expected to reach the farmer for a number of years.

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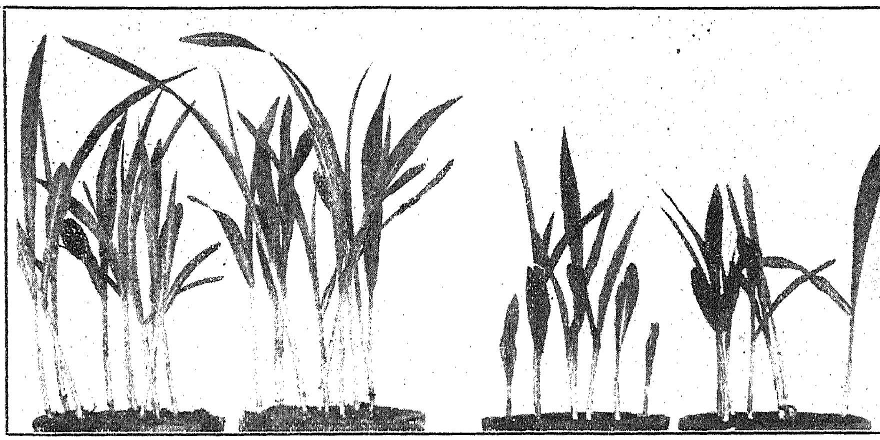
A New Fusarium Disease of Maize.

A PRELIMINARY NOTE ON THE PATHOGENICITY OF *Fusarium moniliforme* (SHELD.) VAR. *subglutinans* WR. & RG., AND ON THE OCCURRENCE OF ITS HITHERTO UNRECORDED ASCIGEROUS STAGE, *Gibberella Fujikuroi* (SAW.) WR. VAR. *subglutinans* N. COMB.

E. T. EDWARDS, B.Sc.Agr., Assistant Biologist.

BOTH *Gibberella saubinetii* (Mont) Sacc. and *Fusarium moniliforme* Sheld. are common pathogens of maize in New South Wales, and are responsible for serious root, stalk and cob rot diseases. The perithecia of *Gibberella saubinetii* develop abundantly on diseased stalks in the field, and, in view of



Maize Seedlings, eighteen days from Sowing.

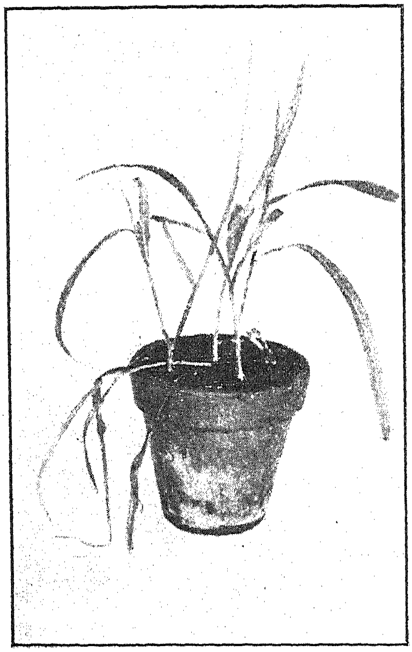
Left.—Grown in sterilised soil. *Right.*—Grown in soil inoculated with *Fusarium moniliforme* var. *subglutinans*.

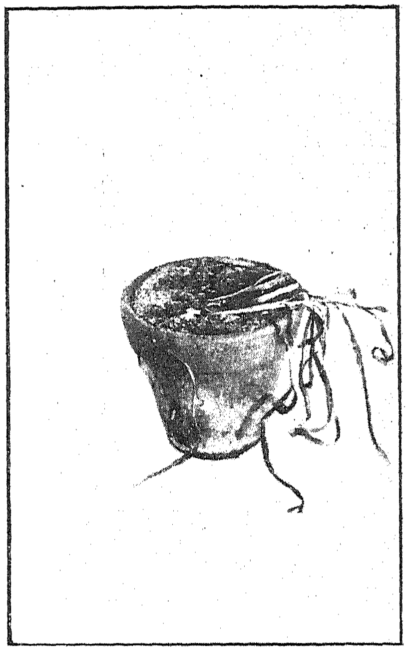
[*Photo by P. R. Maguire.*

the prevalence of *Fusarium moniliforme,* it was considered that a careful examination of perithecial material might demonstrate the occurrence of the ascigerous stage, *Gibberella moniliformis* (Sheld.) Wineland.

In May, 1932, specimens of old maize stalks bearing perithecia were received for examination from Grafton Experiment Farm. Microscopic examination showed that certain of the specimens were bearing perithecia which contained straight, usually one septate ascospores with blunt, more or less rounded ends, which contrasted sharply with the curved, typically three septate ascospores of *Gibberella saubinetii,* and which seemed to correspond with Wineland's description of the ascospores of *Gibberella moniliformis* (Sheld.) Wineland. In June of the same year, similar perithecial material was collected by the writer from an old maize field at Bathurst Experiment Farm.

Preliminary cultural studies with a number of single ascospore isolations indicated that the conidial stage of the organism was distinct from *Fusarium moniliforme* Sheld. More detailed cultural and morphological studies showed that the organism had close affinities with *Fusarium moniliforme* Sheld. var. *subglutinans* Wr. and Rg., which is differentiated from the type principally in the manner of production of the microconidia. As all cultures had been derived from single ascospores, and as the ascigerous stage of *Fusarium moniliforme* var. *subglutinans* was unknown, the precise identity of the organism was in doubt. The cultures and specimens of the





Maize Seedlings infected with *Fusarium moniliforme* var. *subglutinans*.
Left.—Twenty-eight days after sowing in inoculated soil.
Right.—Thirty-five days after sowing in inoculated soil.
[*Photo by P. R. Maguire.*

perithecial material were submitted for final identification to Dr. Wollenweber, of the Biologische Reichsanstalt fur Land—und Fortswirtschaft, Berlin-Dahlem, Germany. Dr. Wollenweber identified the conidial stage as *Fusarium moniliforme* (Sheld.) var. *subglutinans* Wr. and Rg., and suggested that the perithecial stage, which was new to science, should be designated *Gibberella Fujikuroi* (Saw) Wr. var. *subglutinans* n. comb.

Gibberella Fujikuroi (Saw) Wr. is the ascigerous stage of *Fusarium moniliforme* Sheld. var. *maius* Wr. and Rg., and morphologically *Gibberella Fujikuroi* var. *subglutinans* is distinguished from it by the fact that in the latter the asci are more often eight-spored than four- to six-spored, the ascospores are not so thick, the microconidia are not formed in chains and the macroconidia are smaller in size and show less septation.

The pathogenicity of the organism on maize has been clearly established. Extensive leaf necrosis has been produced by spraying young seedlings with a spore suspension. Pronounced seedling blight, root-rot and damping-off of seedlings have resulted from pure culture inoculation of sterilised soil. Stalk inoculations have shown that the organism is capable of causing extensive necrosis of the internal stalk tissues, and its ability to cause a cob and grain rot condition has also been demonstrated.

Survey work has shown that the organism is fairly widely distributed throughout the maize-growing areas of New South Wales, and isolations from many seed samples have shown that the organism is commonly carried internally in the grain.

As far as the author is aware, this is the first record of *Fusarium moniliforme* (Sheld.) var. *subglutinans* Wr. and Rg. as a parasite of maize. It is intended to publish the details of the cultural, morphological and infection studies, together with a description of the ascigerous stage of the fungus, as a Science Bulletin.

Keep Mice Out of Your Stacks.

At one time or another most farmers have been made to realise the great amount of damage that mice are capable of doing. With a little trouble and not a great deal of expense this can be averted. One method is to build the stack on a raised platform or straddle, the supporting blocks being capped with galvanised iron or inverted petrol or kerosene tins to prevent the mice climbing to the platform. Another method is to enclose the stack with a fence of galvanised iron (plain or corrugated) about 2 feet high. Let the iron into the ground to a depth of 4 inches and give it a slight lean outwards. Take care to leave no open spaces at the corners. If mice are already in the stack, they can at least be kept in check by poisoning them with arsenic water placed in dishes around the stack.

A Stack of Bagged Wheat after Mice had finished with it.

Tobacco Notes for December.

C. J. TREGENNA, Tobacco Expert.

Illustrating What Was Said Last Month.

In the last issue of this *Gazette* the importance of a complete fertiliser for tobacco was stressed; that is, a fertiliser containing nitrogen, phosphoric acid and potash. The point was also stressed that it was so much waste of money unless the fertiliser was applied in sufficient quantity.

The accompanying block strikingly illustrates the benefit to be derived from the application of fertilisers.

Use a Complete Fertiliser Mixture for Tobacco.
Left.—Plants received a complete fertiliser mixture. *Right.*—No fertiliser was applied to these rows.

Inter-cultivation of the Crop.

After the young plants have commenced to grow and until such time as further cultivation cannot be carried out without damaging the leaves of the plants, the crop should be cultivated every week or ten days. Where irrigation is practised, cultivation should be undertaken as soon as the ground begins to harden or crust.

Tobacco responds well to cultivation, and the grower should aim at keeping his land in fine tilth and free from weeds, so that excessive evaporation of moisture is avoided. The cultivation should be shallow as the root system of the tobacco plant is largely near the surface. Use the horse cultivator and hoe and when the plants are high enough arrange the tines of the cultivator so that the earth is gradually drawn from between the rows towards the crowns of the plants. Avoid pronounced ridging, as it will induce drying-out of the soil.

Glasshouses Here and Abroad.

Some Interesting Comparisons.

(Continued from page 799.)

JOHN DOUGLASS, H.D.A., H.D.D., Senior Agricultural Instructor.

THE recent outbreak of leaf mould among glasshouse tomatoes in New South Wales will help to emphasise that my comment, in last issue, on the necessity for the construction of up-to-date houses was not made before its

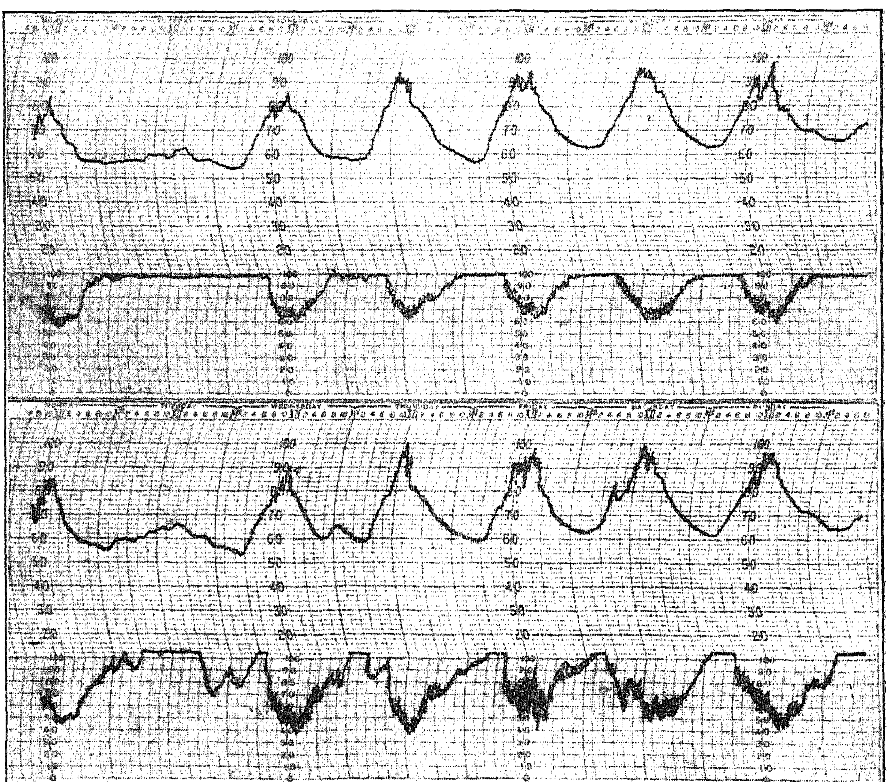


Fig. 1.—Thermograph Charts showing Temperature and Relative Humidity Readings in a Glasshouse.

time. Leaf mould is a disease associated with poorly-constructed and badly-ventilated houses, and is liable to cause heavy annual losses and even to become a major disease while crops are produced under present conditions. New South Wales growers were fortunate that the disease did not occur

when the plants were very small, for if it had been present in the seed beds instead of when the fruit was almost fully grown, the results would have been much more serious.

Ventilation and Disease.

The relative humidity within the glasshouse is an important factor in the occurrence of fungous diseases, periods of total saturation being ideal for their development. By means of efficient systems for controlling the ventilation, and for heating the houses, American growers are able to reduce

Fig. 2.—Plants growing in a Well-ventilated House.

Only lightly infected with disease.

Fig. 3.—Plants Growing in a Glasshouse Not Well-ventilated.

Showing dead and dying foliage, the result of serious infection with leaf mould.

losses from fungous diseases. The accompanying illustration shows charts made in Ohio, U.S.A., by thermograph, during the second week of June, which is in the summer season. The lower chart was made in a greenhouse

which is artificially heated and where maximum ventilation is allowed to reduce the relative humidity, while the upper one was made in a house where little provision is made for ventilating.

In each graph the top line indicates the temperature and the lower line gives the humidity readings. It is interesting to note in the lower chart, the influence of ventilation in raising the temperature, and in shortening the length of the periods when the humidity was at 100 per cent., providing ideal conditions for development of fungous diseases.

The result of the treatment given these two houses can be seen by a study of the accompanying photographs of the tomato crops grown therein. Fig. 2 shows plants in the well-ventilated house, with only a light infestation of disease, while Fig. 3 shows the plants in the house not well ventilated, which were seriously affected with leaf mould, as evidenced by the dead and dying foliage right to the top of the vines.

The Advantages of Heating Glasshouses.

Most of the tomatoes grown in New South Wales glasshouses are raised without any artificial heat; the function of our glasshouses is to protect the plants from unfavourable weather, and to attract and conserve sufficient heat from the sun during the day time to carry the plants over the night. Glasshouses overseas are so made that they can be heated artificially for the growing of certain plants. The fact that we are producing tomatoes without heat is not sufficient evidence to condemn the heating of our houses; in fact the lack of heat is definitely responsible for the majority of failures in our houses. In the first place, we have instances of frost injury each year; so severe is this injury in some cases that plants are either defoliaged or killed outright. Every year in all districts one can find houses in which the flowers have failed to pollinate and have fallen from the plants during cold snaps. In other instances a faulty pollination of the flowers occurs, resulting in the formation of small, ill-shaped, poorly-flavoured fruits of little value.

Disease in Relation to Heating.

During the winter months the chief disease the Australian glasshouse grower has to contend with is Irish blight, which thrives in unventilated houses with a wide range of temperature variation. Oversea glasshouse growers are not familiar with this trouble because they maintain comparatively even temperatures in their houses. In most cases in this country it is not that the temperatures are too low, but that they vary too much. For example, it is quite a common experience around Sydney to find houses registering 90 degrees during the middle of the day, and for the temperature to fall to 30 degrees early in the morning. There is a close relation between heating and the relative humidity of the house, and when a house is artificially heated some control over the humidity may be obtained by efficient ventilation.

The mildest case of leaf mildew I have seen in New South Wales was much more severe than the worst I saw in U.S.A. On the other hand, some growers in New South Wales who practice ventilation are able to avoid this trouble. I feel certain that if other growers would provide for ventilation of their houses and instal heating systems, the problem of leaf mildew would cease to exist in this State.

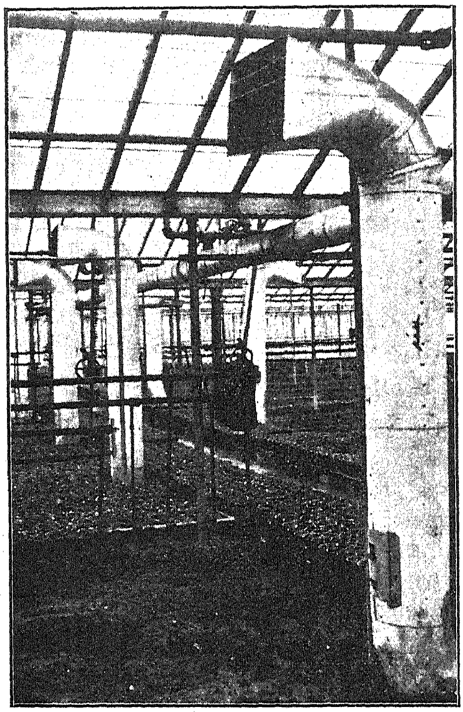


Fig. 4.—Huge Air Fans (Housed outside the Glasshouse) are used to operate such a System as this.

The wide variation experienced daily in our glasshouses makes it necessary to grow varieties of tomatoes that will withstand these variations, and will be capable of pollination at a relatively low temperature. Where the house is heated, growers have a wide range of varieties, and may even plant *Fusarium* resistant types, which have proved to be so unsuitable for our houses. In Ohio, U.S.A., the variety Mahona, which is a resistant type selected by Dr. Hoffman, of the State Research Station, is actually used as the standard.

In a heated and well-ventilated house, less water condenses inside the roof and on the plants than is the case with our standard types of house. Not only would ventilation minimise disease, but it would also prevent rusting and decay of the timbers and steel of the structure.

Systems of Heating.

I saw many types of house and various systems of heating houses on my trip. In Canada and U.S.A., where the winter temperatures fall very low, steam is universally used for heating, and in England and the milder climates of North America, hot water heating is universally used. Electricity and hot air are also used for heating small propagation frames and houses, but these mediums cannot be recommended at the present stage of development for heating houses in Australia.

The method of heating houses has made some very radical changes in the last few years in North America. The old idea was to run a large number of hot water or steam pipes around the inside of the outside wall of the house, with an occasional one through the various sections of the house.

Fig. 5.—Steam Heating Pipes along every third row is the Latest Method of Heating Glasshouses in America.

This system provides even distribution of heat and tends to reduce humidity.

[*Photo by I. C. Hoffman.*

It was found that in houses with concrete dwarf walls, this system of heating did not result in uniform temperatures, and did not assist the movement of air and the ventilation of the house as was anticipated. The most up-to-date method of heating is to have a limited number of pipes around the outside walls, with 1 inch pipes down every third row of plants. This system was found definitely to decrease the humidity of the air between plants and also to counter mildew.

The Effect of Posts in the Houses.

The ideal house should be free of posts, and it is always desirable to eliminate as many of the posts as economically possible when planning a building. Posts in a glasshouse not only interfere with cultivation, arrangement of the plants, etc., but throw many shadows which are undoubtedly a handicap under all conditions. One of the most important objections to posts is that they prevent thorough sterilisation of the soil; particularly is this the case when the posts are of wood.

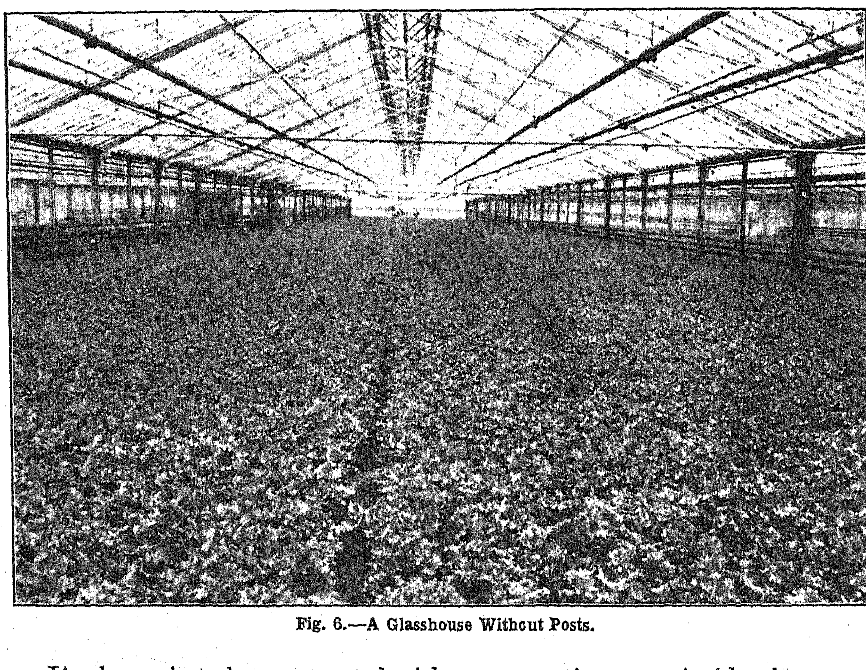


Fig. 6.—A Glasshouse Without Posts.

If a house is to be constructed without supporting posts inside, the structure will require to be made of heavier material than is the case in Australia at the present time, and under all conditions the frame of the house will have to be braced. The methods of bracing American houses vary with the type—one method is shown in an accompanying illustration. By far the best material for the frame is steel. I inspected several steel houses 50 feet in width without a single supporting post, in U.S.A. The only disadvantage of this type of frame for our conditions is the cost.

Is There a Local Market for More Potatoes?

A Successful Grower Gives His Views.

Speaking at a recent gathering of farmers, Mr. H. J. Conlon, of "The Downs," Exeter, and the winner of the Southern District Potato-growing Championship for the last two years, pointed out that if local growers were to compete more successfully with Tasmanian growers on the Sydney market they would have to turn their attention to supplying the demand from November to March, particularly during January and February. For the past ten years the prices during those months, Mr. Conlon pointed cut, had been higher than at any other time during the year.

Cater for the January-February Market.

The position was that the main-crop potato areas in New South Wales matured their crops too late, while the coastal growers generally harvested a little too early for the January-February market. Under those conditions the Tasmanian potato met with very little local competition, and the enhanced prices received during those two months ensured good average prices over the whole year. Take away the extra profits received during those two months and the Tasmanian growers would most probably find it did not pay to keep up supplies during the other months when prices were considerably lower. Thus not only would local growers reap some of the high prices ruling in January and February, but, because of less competition from the imported article during the other months, would most likely experience better prices (certainly a firmer market for their produce) all the year round.

According to statistics, our average yearly consumption of potatoes was about 112,400 tons, of which we produced only 49,000 tons. Out of that latter amount about 13,000 tons were used for seed each year. About 75,000 tons were imported annually from Tasmania, a quantity very much greater than our total production. Freight and other charges from Tasmania amounted to 33s. 6d. per ton, and about 23s. 6d. per ton from Victoria by boat. By comparing these charges with similar local charges New South Wales growers would get some idea of the advantages in this respect that they had over the importer.

The Berrima District can Supply this Market.

The possibility of supplying the January-February demand was considered at the last Potato Growers' Conference, when it was unanimously agreed that the Berrima district (comprising such centres as Exeter, Moss Vale, Robertson, and Burrawang) could supply this market. It was merely a question of maturing the crop at the correct time, for in all other matters

it had been demonstrated that the local article could be made to compare favourably with the imported. Certainly the average for the whole of the district was at present relatively low, but that this yield could be raised substantially had been proved by the results obtained in potato-growing competitions. As to cutting quality the Berrima district potato had no superior; this point had been demonstrated in open competition at the Sydney Royal Show. At present our grading was not all that could be desired, but this difficulty could be easily overcome. On the other hand, the Tasmanian product was generally clean and bright, well-graded, and always put up in new bags. To obtain a clean sample it was necessary to dig when the ground was not too damp. As regards other cultural methods, Mr. Conlon urged that the recommendations of the Department of Agriculture be closely followed. "If I had done so years ago," he concluded, "I would have saved money and the many years of experimenting which it took me to reach the same conclusions in the end."

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1934.

Dapto	Jan. 9, 10	Cobargo	Mar. 14, 15
Albion Park	„ 16, 17	Cooma (G. E. Metcalfe)	„ 14, 15
Kiama	„ 24, 25, 26	Muswellbrook (R. C. Sawkins)	„ 14, 15, 16
Berry	„ 30, 31	Goulburn	„ 15, 16, 17
Wollongong	Feb. 5, 6, 7	Camden (C. New)	„ 15, 16, 17
Nowra	„ 12, 13, 14	Gloucester	„ 20, 21
Inverell (E. A. Clarke)	„ 20, 21, 22	Mudgee (T. P. Gallagher)	„ 20, 21, 22
Newcastle (P. G. Legge)	„ 21 to 24	Bemboka	„ 21, 22
Gunning (G. E. Ardill)	„ 22, 23, 24	Gunnedah (Reg. A. Brown)	April 10, 11, 12
Pambula	„ 23, 24	Kempsey	„ 11, 12, 13
Yass (S. C. Sleeman)	„ 27, 28	Narrabri (D. McR. Fraser)	„ 18, 19
Moruya (H. P. Jeffrey)	„ 27, 28	Dungog (W. H. Green)	„ 19, 20, 21
Taralga	„ 27, 28	Gresford (A. R. Brown)	„ 27, 28
Maitland (Montie Brown)	„ 28, Mar. 1, 2, 3	Trangie (F. H. Hayles)	May 15, 16
Nabiac (A. A. M. Clarke)	Mar. 1, 2	Peak Hill (W. R. L. Crush)	July 24, 25
Moss Vale (H. Richardson)	„ 1, 2, 3	Tullamore (W. J. Colville)	Aug. 1
Queanbeyan	„ 2, 3	Trundle (D. Leighton)	„ 7, 8
Candelo Jubilee	„ 2, 3	Condobolin (J. M. Cooney)	„ 14, 15
Bega	„ 7, 8	Bogan Gate (J. T. a'Beckett)	„ 22
Braidwood	„ 7, 8	Parkes (L. S. Seaborn)	„ 28, 29
Crookwell	„ 8, 9, 10	Forbes (F. N. Sykes)	Sept. 4, 5
Cooma	„ 14, 15	Leeton (E. C. Tweedie)	Oct. 9, 10

Extension of Time for Lodgment of Appraisement Applications.

The Minister for Lands recently announced that the Government was preparing legislation for introduction to Parliament during the present session with a view to extending the time until 2nd October, 1934, for lodgment of applications for appraisement of the capital values and annual rentals of Crown holdings.

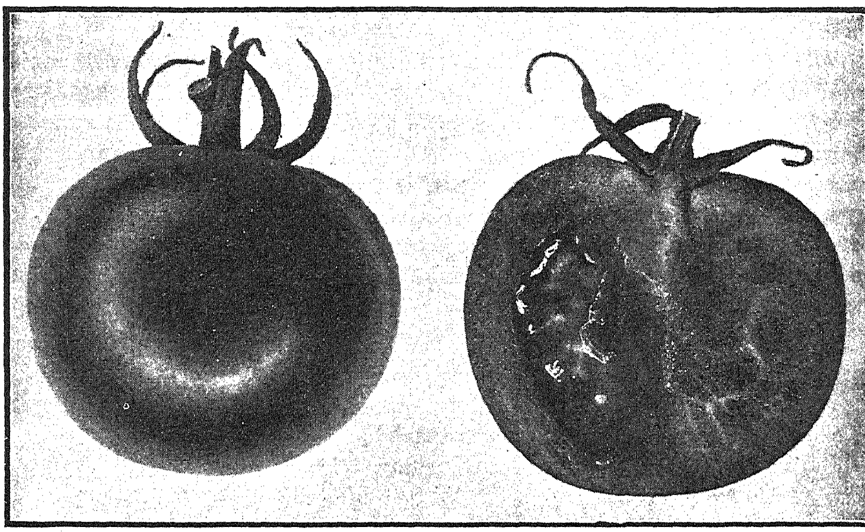
Applications may be lodged with Crown Land Agents in the meantime.

Cool Storage of Tomatoes.

TRIALS TO DATE ARE NOT VERY ENCOURAGING.

THE practicability of holding tomatoes in cool storage mainly with the idea of relieving temporary gluts and thus ensuring better average returns was investigated quite recently.

Messrs. Granger Bros., of Narrandera, writing to the Department earlier in the year, mentioned that tomatoes if picked green would keep up to two months in their district at an average temperature of 50 deg. Fahr. (natural temperature), the fruit gradually ripening during storage. They



Bonny Best, the Variety Used in the Local Trial.

suggested that perhaps it would keep for several months at a lower temperature in a cool store. Subsequently they forwarded four cases of Bonny Best tomatoes to the Sydney Municipal Cold Storage Works for trial.

Storage at 34 deg. Fahr.

The tomatoes were very green when stored; no special attention was given to the method of packing, the cases being merely lined with paper. The storage temperature was about 34 deg. Fahr. For the first three weeks no alteration was noticed in the colour or appearance of the tomatoes, and when cut open they appeared the same as when placed in store. At the end of four weeks a slight shrivelling of the skin, especially around the stalk, was noticed, and the colour, if anything, was not as green as before. After the sixth week the fruit broke down completely, spots of mildew

appeared around the stalk and anywhere on the skin where there were any blemishes, the colour changed to a yellow-green and the fruit took on a distinct waxy or glassy appearance.

Apparently three to four weeks would be the limit of cool storage for this variety of tomato under the conditions observed above, as from this time the fruit very quickly deteriorated and it is very doubtful if it could be taken from store and ripened before it broke down completely.

Overseas Tomato Storage Investigations.

In the report of the Food Investigation Board for 1927 (England), it is stated that tomatoes kept at a temperatue of 34 deg. Fahr. for four days or less ripened normally at ordinary temperature and showed a rate of wastage no greater than that of tomatoes which had not been exposed to a low temperature. If, however, the period during which the tomatoes were kept at 34 deg. Fahr. was increased to six or more days the fruit failed to ripen normally after removal from storage and an unusually rapid wastage occurred. It also stated that tomatoes are injuriously affected by storage for more than a short time at temperatures below 50 deg. Fahr.

The injurious effects of storage at 34 deg. Fahr. is not reflected in rate of wastage while the fruit is kept at that temperature, but becomes apparent after removal to higher temperature. Storage at this low temperature would only be of value if consumption occurred before fungal rotting commenced, which may begin within twenty-four hours after removal from storage.

In a more recent publication, viz., *Tropical Agriculture* (B.W.I.), Vol. X, No. 6, Messrs. Wardlaw and McGuire state that they found that tomatoes picked full grown but green could be successfully held in cold storage at 47.5 deg. Fahr. for periods up to twenty days, and thereafter ripened and held at 70 deg. Fahr. for ten to fourteen days without undue wastage. Fruit that had escaped fungal infection did not undergo rapid deterioration on removal from cold store.

Some Recently Issued Publications.

The following recently issued publications are obtainable from the Department of Agriculture, Box 36A, G.P.O., Sydney:—

Laying Out and Planting an Orchard.
The Combining of Sprays.
Lime and Tobacco Dust.
Leaf Curl of Stone Fruits.
The Correct Stages at Which to Spray for Black Spot of the Apple.
Etiology of the Chocolate Spot Disease of Broad Beans.
Varieties of Wheat in New South Wales. (Price, 1s. 2d. posted.)
Cheesemaking. (Price, 1s. 1d. posted.)

Where no price is indicated the leaflets will be forwarded free of charge.

Campaign for Control of the French Bean Fly.

A Commendable Effort.

As the outcome of meetings recently held at Tumbi Umbi and Matcham, growers have decided to inaugurate a voluntary campaign for the control of this pest in the districts extending approximately between Gosford, Wyong and The Entrance (Tuggerah).

Twenty or thirty years ago, before this fly became a serious pest in these districts, autumn as well as spring beans were a very remunerative crop. To-day, however, owing to the prevalence of the fly along the coast north of the Hawkesbury River, during the summer and autumn, bean-growing is restricted almost entirely to the spring. The fly actually is present to a very slight extent in spring crops, but never causes serious damage. By December and January, however, it has become fairly abundant and crops from then onwards are heavily infested. The flies commence their attack as soon as the plants appear through the ground, laying their eggs in the leaves. In the summer the eggs hatch within two to four days. The grubs, or maggots, burrow through the cover tissues of the leaves to the leaf stalks, and pass down these into the stems where the conducting tissues beneath the outer bark-covering are destroyed, causing a ring-barking effect to the plants. The maggots are fully grown in ten to twelve days after hatching from the eggs. They then pass into a pupal or resting stage inside the stems and the flies commence to emerge in another ten or twelve days. The period for development from egg to adult stage is therefore three to four weeks during the warmer months. During the cooler months the stages are longer and it takes six to eight weeks for development from egg to adult.

In breeding experiments which were carried out at the farm of Mr. J. T. Bohringer, Tumbi Umbi, by Mr. W. L. Morgan, Assistant Entomologist, female flies lived three to four weeks and laid 50 to 300 eggs over a period of two to three weeks. A female in a single day may lay 20 to 40 eggs, the larvae from which may destroy two to four plants.

Unlike most other insects the bean fly cannot be controlled in its immature stages by spraying, as the eggs, grubs and pupae all occur within the tissues of the plant. Poison foliage sprays to destroy the adults before they lay their eggs in the leaves have distinct possibilities, and will be the subject of further investigation this year.

A study of the breeding habits of the fly during the summer months suggests that it should be possible to obtain control by regulating planting and by clean cultivation methods. Growers in the Tumbi Umbi and Matcham

districts have decided to give this method of control a thorough trial during the next few months. Campaign committees which will work in conjunction with officers of the Department have been formed to ensure that the experiment is given a thorough test.

The fly breeds during the summer and autumn chiefly in self-sown plants, which come up after every shower of rain. Spring crops which are left in the ground long after picking is finished provide the seed for these self-sown plants. The growers in the area of the experiment will, therefore, endeavour to establish a break of at least six weeks, during which no bean plant of any description will be available for the fly to breed in. It is hoped by this means that the flies will be reduced to negligible proportions by the time the autumn planting commences. Under the scheme growers have agreed not to plant any beans from 10th November to 15th March, and to pull up and burn crops that are now in the ground, as soon as picking is finished.

Flour Acquisition—Refund on Excess Stocks.

When the Flour Acquisition Act came into operation on the 30th March, 1931, for the purpose of raising funds to assist necessitous farmers, it was necessary for bakers, storekeepers, and others to pay to the Government a sum of £2 15s. per ton on the quantities of flour in excess of one ton on hand at that date.

This measure will expire on the 31st December next, and the Government does not intend to re-enact it. When the Act expires, many storekeepers and bakers will be in possession of considerable quantities of flour which they will have to utilise or sell after the 1st January, and consequently they will be called upon to compete with flour sold after that date, which has not been subject to the impost made under the powers conferred by this measure. It is therefore proposed that a refund should be made in connection with these stocks, and, in announcing the Government's decision in this direction, the Minister for Agriculture (the Hon. Hugh Main, M.L.A.) states that it is proposed to make an allowance of 30s. per ton on every ton of flour in excess of two tons which may be held in stock by storekeepers or bakers as at 30th December next, subject to the persons intending to claim such payment notifying their intention in writing to the local police officer not later than noon on Wednesday, 27th December. Mr. Main emphasises that applications will not be considered unless the required notice is given, and points out also that no payment will be made unless the quantity held is in excess of two tons. Returns of stocks on hand after deducting the two tons will require to be submitted to the local police officer, who will check same after 8 a.m. on Saturday, 30th December. No refund will be allowed in respect of flour in transit.

The Minister added that he desired it to be clearly understood that this payment is being made as an act of grace, and, therefore, in the case of any dispute that may arise, his decision will be final.

Whiptail Disease of Cauliflowers can almost be Eliminated by Liming.

C. J. MAGEE, M.Sc., B.Sc.Agr., Plant Pathologist.

SERIOUS losses from whiptail disease occur almost every season with certain cauliflower varieties grown in this State. In many instances total failure of crops is experienced, while in other cases the yield of heads is considerably reduced. The most susceptible varieties are those which have been selected by growers and seed companies for early maturity.

Plants showing whiptail in characteristic form have narrow, ruffled, distorted leaves with irregular margins (Fig. 1). In extreme cases the

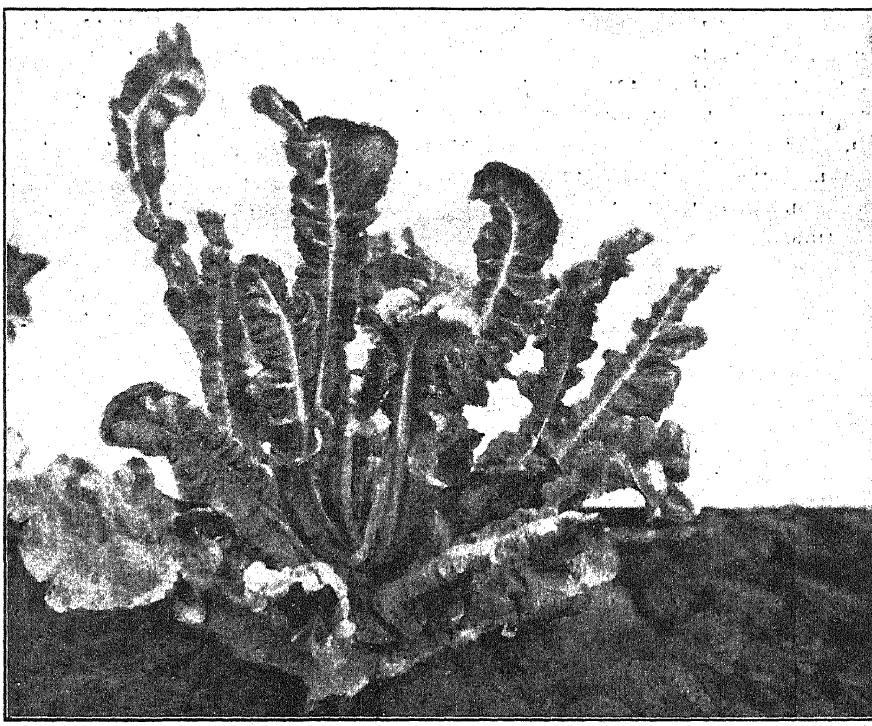


Fig. 1.—Cauliflower affected with Whiptail, grown in Unlimed Soil (Plot A).

laminae may be entirely absent and the centre of the plant may consist of midribs only. Plants affected in the seedling stage usually fail to form heads, while those severely effected at a later stage produce leafy culls. Lightly affected plants, however, frequently recover and form small marketable "flowers."

The percentage of whiptail plants in a crop varies considerably. It is
ıite common to see every plant affected, although more often about 20 to
) per cent. of the plants of early-maturing varieties show the disease.

Whiptail is a physiological disease associated with high degrees of soil
:idity. Some years ago, experiments conducted in Long Island, U.S.A.,
.dicated that the disease could be controlled by the application of lime to
.e soil. Early attempts to apply this knowledge in New South Wales were
ısuccessful, and it is now known that owing to the high acidity of our
ils, sufficient lime was not used in the trials to exercise any appreciable
fect.

Liming Experiment for the Control of Soil Acidity.

During the 1933 season an experiment was conducted which showed that
latively heavy dressings of agricultural hydrate of lime would reduce
hiptail to negligible amounts. Messrs. May Bros., of Pitt Town, near
'indsor, co-operated with the Department in making available an area of
nd for the experiment, and the necessary lime was kindly donated by the
ommonwealth Portland Cement Company. The area was divided into
ve plots, A, B, C, D and E, each measuring one-tenth of an acre. Deter-
inations of the acidity of the soil in the plots were made by Mr. N. H.
arbery, of the Chemist's Branch. The soil was uniformly strongly acid
ıroughout the plots. It was decided that in order to reduce the acidity
: the soil to a mildly acid condition, which in other parts of the world has
ɜen shown to be the best for cauliflower growth, relatively heavy dressings
: lime would be necessary.

TABLE 1.—Percentage of Whiptail in Plots.

Plot and Treatment.	Percentage of Whiptail. (21st April, 1933).	Percentage of Whiptail. (19th May, 1933).
	per cent.	per cent.
A—Unlimed	91	90
B—Limed	3	1
C—Unlimed	87	86
D—Limed	2	0
E—Unlimed	89	91

Plots B and D each received 336 lb. (or at the rate of $1\frac{1}{2}$ tons per acre)
f agricultural hydrate of lime, which was broadcasted evenly by hand and
loughed in on 19th January, 1933. Plots A, C, and E were unlimed.
eedlings of May Bros.' strain of "Four Months" about six weeks old were
lanted in furrows in all plots on 17th February. About 600 plants were
ɜt out in each plot. A fertiliser mixture consisting of five parts of super-
hosphate, three parts of bonedust and one part of sulphate of ammonia
'as applied along the furrows at time of planting in all plots at the rate
f 5 cwt. per acre. A top-dressing of sulphate of ammonia at the rate of
bout 1 cwt. per acre was made about one month before commencement of
ıtting.

Liming Improved the Yield by 3 Tons Per Acre.

From the outset, the plants in the limed plots made better and more uniform growth than those in the unlimited plots. The percentages of whiptail, in light, medium and severe forms, in the different plots on 21st April and 19th May are shown in Table 1. The limed plots were almost free from whiptail as compared with about 90 per cent. of affected plants in the unlimed areas.

TABLE 2.—Number and Weight of Heads from Adjacent Limed and Unlimed Plots, with Dates of Harvesting.

Date of Harvesting.	Limed (Plot B).		Unlimed (Plot A).	
	Number.	Weight (untrimmed).	Number.	Weight (untrimmed).
1933.		lb.		lb.
5th June	74	444	15	73
7th ,, ...	73	445	37	198
8th ,, ...	83	486	24	114
9th ,, ...	98	602	42	234
10th ,, ...	41	244	42	206
12th ,, ...	78	444	114	588
14th ,, ...	71	371	75	357
15th ,, ...	11	58	100	450
16th ,, ...	14	60	34	133
19th ,, ...	5	33	15	86
21st ,, ...	8	36	11	33
24th ,, ...	3	10	7	19
Totals	559	3,233	516	2,491

Most of the whiptail plants in the plots recovered to some extent and formed heads, which, though of poor type, were marketable owing to a heavy demand for cauliflowers. Table 2 shows the number and weight of heads harvested from Plots A and B. It will be seen that 559 heads, weighing 3,233 lb., were cut from the limed plot, as compared with 516 heads weighing 2,491 lb. from the unlimed plot, a difference at the rate of about 3 tons per acre. The heads harvested from the limed plot were nearly all of first-grade quality, while those from the unlimed plot were smaller and of poorer type. The average weight of untrimmed heads from the limed plots was 5.7 lb., as compared with 4.8 lb. from the unlimed area. A comparison of the dates of maturity shows that during the first week of harvesting the number of heads cut from the limed plot was about double that from the unlimed. With an early-maturing variety this is of importance.

Recommendation.

The results of the above experiment are so striking and they conform so closely to those obtained in other parts of the world, that cauliflower growers should not hesitate to make use of the information the experiment has yielded.

Acidity surveys which have been made of "whiptail" soils in this State show that such soils are always strongly acid and are in need of heavy applications of lime to render them safe for cauliflower culture. While the quantity of lime required will vary somewhat with the degree of acidity of the soil and the soil type, nevertheless, for trial purposes growers can accept the tentative recommendation of a dressing of 1½ to 2 tons of agricultural hydrate of lime per acre. The lime should be broadcasted evenly and ploughed in at least one month before the seedlings are set out. It is advisable to lime the seed bed as well, at the rate of 1 lb. per square yard, some weeks before the seed is sown.

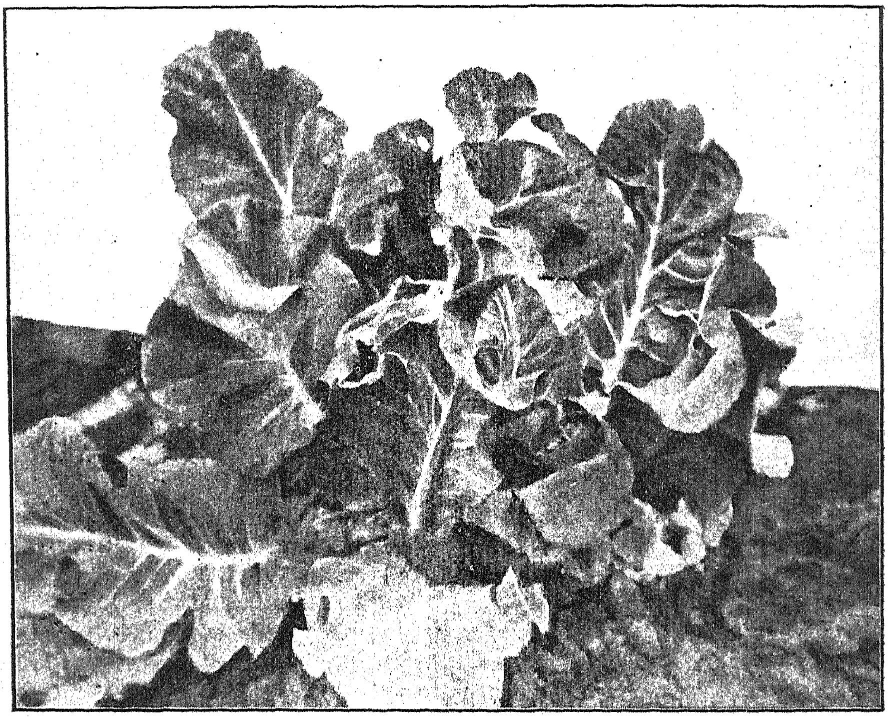


Fig. 2.—Healthy Cauliflower grown in Limed Soil (Plot B).

Hydrate of lime is recommended, although it is probable that finely-ground limestone will also be effective and a field trial to test this has been planned.

Land, the acidity of which has been adjusted by liming to render it favourable for cauliflowers, will probably be unsuitable for potatoes, owing to the fact that the reduction of acidity will favour common scab disease (*Actinomyces scabies*). Cauliflowers and potatoes should, therefore, not be included in the same rotation. Heavy liming, however, will improve the land for practically all other vegetables.

The Pumpkin Beetle.

Aulacophora hilaris Boisd.

(Concluded from page 815.)

W. L. MORGAN, B.Sc.Agr., Assistant Entomologist.

In a previous issue Mr. Morgan discussed the distribution and economic importance of the pumpkin beetle and described the pest in its various stages of development.

This concluding portion of the article records data on the life history of the beetle and discusses measures for control.

Notes on the Life History and Habits.

Data on the life history of the pumpkin beetle in captivity were recorded in Sydney during 1930-32.

Little is known of the breeding habits of this beetle in the field. Froggatt recorded the larvae on the roots and stems of pumpkins at Gosford, and consequently it was thought that the beetle commonly developed upon squashes and pumpkins. The writer, however, has searched frequently amongst these crops without finding the immature stages.

Gravid females, which were collected from squashes on 21st October, 1931, laid eggs in captivity on 26th October, but, as neither the eggs nor the larvae have been found in squashes and pumpkins during the spring and early summer, it does not seem probable that the beetle normally breeds in these crops.

Observations Made in the Laboratory.

Paired pumpkin beetles fed, mated and oviposited quite readily in captivity. The adults were fed on pumpkin leaves and the larvae were developed in pieces of pumpkin stems. The larvae left the stems and pupated in soil. In the field, mating occurs away from the food plants, on adjacent trees and weeds. The females copulated several times throughout the egg-laying period.

Egg-laying.

The eggs were laid on moist surfaces, preferably damp soil. Records during 1931 of twenty-four females (Table I) show that egg-laying usually commenced from ten to twenty-five days after emergence, the shortest period being ten days. During periods of maximum egg-laying activity the females laid a batch of twenty to seventy eggs every two to three days. The average number of eggs laid by a female was 490; the largest number 1,721.

Egg-laying, but for five small lots in June and another in July, ceased during the cooler months from the third week of May to the second week of September. The average period over which eggs were laid by six females that emerged between 7th and 12th January, 1931, was seventy-seven days, the longest 134 days. Five of eleven females that emerged between 4th February and 12th March, 1931, in addition to laying eggs in the autumn, lived through the winter and laid more eggs in the spring. Four females that emerged between 27th April and 2nd June, 1931, did not commence egg-laying till the spring. The average number of eggs laid by a female after overwintering was 284, the greatest 457. Egg-laying after overwintering extended from 18th September, 1931, to 4th January, 1932, but more than 95 per cent. of the eggs were laid during October, November, and the first three weeks of December.

TABLE I.—Length of Life and Egg-laying Records.

Date of emergence.	Females.						Males.	
	Length of life.		Egg-laying records.					
	Date of death.	Life period in days.	Date first eggs laid.	Date last eggs laid.	Egg-laying period in days.	No. of eggs laid.	Date of death.	Life period in days.
7–1–31	10–8–31	215	17–1–31	30–5–31	134	1,721	2–9–31	238
8–1–31	3–8–31	207	17–1–31	8–5–31	112	843	6–1–32	363
8–1–31	......	...	......	......	...	...	14–4–31	96
9–1–31	28–3–31	78	11–3–31	21–3–31	11	132	3–9–31	237
12–1–31	24–8–31	224	3–2–31	16–5–31	103	507	13–4–31	91
12–1–31	17–9–31	248	3–2–31	20–3–31	46	369	5–9–31	236
12–1–31	7–4–31	85	3–2–31	2–4–31	59	548	17–1–32	370
12–1–31	......	...	......	......	...	...	7–10–31	268
29–1–31	......	...	......	......	...	...	23–3–31	53
4–2–31	26–11–31	295	27–2–31	14–11–31	261	946	30–4–31	85
5–2–31	11–5–31	95	18–2–31	9–5–31	81	758	6–12–31	304
5–2–31	22–8–31	198	20–2–31	29–5–31	99	1,097	14–4–31	68
12–2–31	6–1–32	328	30–3–31	1–12–31	247	426	14–4–31	61
22–2–31	28–3–31	34	20–3–31	20–3–31	1	6	21–3–31	27
23–2–31	3–1–32	314	8–5–31	21–11–31	198	323	15–4–31	51
24–2–31	4–12–31	283	7–3–31	21–11–31	260	962	26–5–31	91
26–2–31	7–9–31	193	23–3–31	23–3–31	1	14	6–12–31	283
10–3–31	19–1–32	315	1–4–31	24–12–31	268	481	......	...
10–3–31	26–7–31	138	24–3–31	29–5–31	67	476	......	...
12–3–31	25–7–31	135	27–3–31	1–7–31	97	695	......	...
10–4–31	24–6–31	75	3–5–31	23–5–31	21	162	......	...
13–4–31	14–11–31	215	23–9–31	14–11–31	53	249	......	...
24–4–31	29–11–31	219	12–5–31	21–11–31	194	469	3–5–31	9
27–4–31	28–11–31	215	25–9–31	23–11–31	60	327	7–9–31	133
30–4–31	26–1–32	271	7–10–31	4–1–32	90	167	......	...
6–5–31	10–10–31	157	23–9–31	7–10–31	15	49	31–8–31	117
2–6–31	29–9–31	119	25–9–31	25–9–31	1	52	10–1–32	222
4–6–31	......	...	......	......	...	...	25–7–31	51

The eggs hatched in from eight to twenty-three days on moist soil, but perished on dry soils. The incubation period was eight to ten days in the

summer, eleven to sixteen days during the spring and autumn, and twenty-three days for eggs laid on 13th May, 1931. Eggs that were laid in June and July did not hatch.

TABLE II.—Egg-laying Records of Over-wintering Females.

Date of emergence.	Date first eggs were laid after emergence.	Date first eggs were laid in spring after over-wintering.	Date last eggs were laid.	Total eggs laid by female.	Eggs laid after over-wintering.
4–2–31	27–2–31	23–9–31	14–11–31	946	457
12–2–31	30–3–31	25–9–31	1–12–31	426	396
23–2–31	8–5–31	23–9–31	21–11–31	323	283
24–2–31	7–3–31	18–9–31	21–11–31	962	392
10–3–31	1–4–31	18–9–31	24–12–31	481	367
13–4–31	23–9–31	23–9–31	14–11–31	249	249
24–4–31	12–5–31	23–9–31	21–11–31	469	394
27–4–31	25–9–31	25–9–31	23–11–31	327	327
30–4–31	7–10–31	7–10–31	4–1–32	167	167
6–5–31	23–9–31	23–9–31	7–10–31	49	49
2–6–31	25–9–31	25–9–31	25–9–31	52	52

The Larvae and Pupae.

The larvae, except when newly hatched, were sluggish in movement. Stems of pumpkins were preferred to the leaves or roots, although adults have been bred from larvae fed entirely on pumpkin leaves. In the laboratory the larvae entered the stems of young plants at ground level and mined upward an inch or so. The larvae pupated in the soil 1 to 6 inches below the surface in a fragile, earthen cell.

A few records only were obtained of the periods of larval and pupal development. The minimum period noted for the development of the larva was fifteen days and the maximum fifty-four days. Where the period from egg to adult was fifty to fifty-three days the larval and pupal stages were each approximately eighteen to twenty days.

The beetles did not overwinter either in the larval or pupal stage. Larvae that hatched from eggs laid during May perished during the winter. Fully developed larvae occurring towards the end of May, however, pupated and the adults emerged in June.

Length of Life—Egg to Adult.

The period of time for development from egg to adult varied from thirty-nine to eighty-four days. Eggs laid between mid-November and mid-February required an average of forty-five days; those laid on 7th March and 29th October, 1931, required an average of seventy-seven days.

The Adult Beetles.

The adult beetles, on emergence were dull in colour, the bright orange pigmentation only developing after several hours. The abdomen was

small and shrunken and did not become normally distended beneath the wing covers until the beetles commenced to feed, which was within a few hours of emerging.

The average length of life of the adult in captivity was 194 days for the female, and 157 days for the male; the greatest length of life being 328 days and 370 days, respectively, for female and male.

Evidence of Hibernation of Adults.

The adults probably hibernate, and are believed to shelter beneath the bark of dead trees and in hollow trees. In captivity a hibernating habit was indicated. Several females that emerged in February and March, 1931, laid numerous eggs in the autumn, and after passing into a somewhat comatose state during the winter, laid a large number of eggs during the spring. These females were fed during the winter; but others lived without food between 26th May, 1930, and 17th September, 1930, after which they were fed and within a week egg-laying commenced.

Most of the beetles that overwintered in 1931 died during November and December, but a few lived till 1932, the last one dying on 26th January, 1932. The first adult to develop from eggs laid in the spring of 1931 emerged on 4th December. It seems probable, therefore, that beetles which appear in the field during October and November each year have hibernated from the previous autumn.

General Notes.

Wet and windy weather interfere with the flight of the beetles; at other times they fly readily. They mostly leave the plants in the late afternoon, and may be found swarming around adjacent trees in the evening. Infestation is general throughout the crop in the case of young plants, but when the beetles are numerous on older plants they concentrate their attack on individual plants. This gregarious feeding habit is not so pronounced when the beetles are less numerous.

Control Measures.

Small Plants up to Three and Four Weeks Old.

Young pumpkin, melon and squash plants are quickly destroyed when the beetles are prevalent, unless infestation is prevented either by applying dust to the plants each day, or by covering the plants with $\frac{1}{10}$-inch mesh wire gauze. Larger plants which are damaged less rapidly may be treated with stomach poison or contact insecticides to destroy the beetles.

Finely-powdered, inert materials, scattered over the leaves repel the beetles from the plants. Wood ashes, which are used by most growers, are inexpensive and readily available, but they do not protect the plants adequately. Some comparative tests were made with several common dusts,

namely, hydrated lime, lime and tobacco dust (equal parts), flour, ground gypsum, wood ashes, sulphur and powdered chalk. Hydrated lime and lime and tobacco dust were the most effective. Either of these dusts prevents serious damage to young plants. They are more repellent, and stick to the foliage better than wood ashes, and whereas the ashes are only satisfactorily applied in the early morning while the leaves are damp, hydrated lime or lime and tobacco dust may be applied at any period of the day. Flour was considerably better than wood ashes, ground gypsum slightly better, and sulphur and powdered chalk were about equal with ashes, as repellents.

Tests on the repellent value of different volatile materials impregnated into hydrated lime were inconclusive; but it may be of interest to note that, in the course of these tests, a ring of hydrated lime on the ground around the plants was found to repel the beetles somewhat.

Spraying with lead arsenate and Paris green repelled the beetles to some extent, but did not afford adequate protection. The repellent value of these sprays as compared with the dusts is indicated in Table III.

TABLE III.—Repellant Value of Dusts and Sprays.

Repellant.	No. of plants used.	No. of plants attacked.	
		8 hours.	24 hours.
Hydrated lime	40	0	0
Wood ashes	40	2	20
Nicotine dust, $2\frac{1}{2}$ per cent.	40	0	0
Lime and tobacco dust (equal parts)	40	0	0
Flour	40	0	9
Powdered chalk	40	0	9
Lead arsenate spray (3 lb. of powder to 50 gals. water)	40	9	7
Lead arsenate spray (2 lb. of powder to 50 gals. water)	40	9	9
Paris green spray (1 lb. to 100 gals. water)	40	17	14
Milk of lime (2 lb. to 4 gals. water)	40	0	*
Untreated (check)	40	40	40

* Severe foliage damage; plants not retreated.

Destruction of the Beetles on Larger Plants.

Spraying with Arsenicals.—When infested plants are sprayed, the beetles sometimes drink some of the spray before it dries on the foliage. In addition droplets of spray collect on the wing covers of the beetle and are brushed off with the legs. Any particles that adhere to the legs and antennae are removed by the beetle running these appendages through the mouth. In three separate tests with Paris green and lead arsenate sprays, some mortality was shown to occur through the beetles sucking the spray into their mouths from the legs and antennae (Table IV).

TABLE IV.—Beetles Destroyed by Sucking Arsenical Sprays from Legs and Antennae.

Spray.	No. of beetles used.	No. dead after four days.	Percentage dead after four days.
			Per cent.
Lead arsenate (3 lb. powder to 50 gals. water) ...	38	14	37
,, ,, ,, ...	38	22	58
,, ,, ,, ...	63	18	28
Average	...	...	39
Paris green (1 lb. to 100 gals. water)	40	8	20
,, ,, ...	38	22	58
,, ,, ...	28	5	18
Average	...	...	33
Control (unsprayed)	40	0	0
,, ...	20	0	0
,, ...	36	0	0
Average	...	...	0
Lead arsenate (1 lb. powder to 50 gals. water)... ...	75	28	37
Lead arsenate (2 lb. to 50 gals. water)	100	22	22
Lead arsenate (3 lb. to 50 gals. water)	39	14	36
Control (unsprayed)	58	2	3

Although approximately one-third of the beetles that are on the plants at spraying may be destroyed in this manner, arsenical sprays do not usually give satisfactory control, the reason being that the beetles do not readily feed upon sprayed foliage. They either leave the sprayed plants and attack untreated ones, or they infest the portions of the plants bearing least arsenical. Moreover, fresh unsprayed foliage soon appears for the beetles to feed on. Arsenical sprays, however, usually give good control after wet or windy weather when the beetles, feeding voraciously, do not avoid the sprayed foliage to the same extent.

Dusting with Arsenicals.—Arsenicals in the form of dusts are preferred to sprays for control of pumpkin beetles. When any finely-powdered material is dusted on the beetles, the insects proceed to brush it off with the legs. The legs themselves, if they become covered in dust are cleaned in the mouth, the result being that some dust collects in the mouth and is swallowed. Thus when infested plants are dusted with arsenicals, the beetles on them are not destroyed to any extent by feeding on the poisoned foliage, but are poisoned by the dust they swallow when cleaning it off

their bodies. Ingested in this manner, lead arsenate (75 per cent., 50 per cent., and 25 per cent.) and calcium arsenate (20 per cent.) in hydrated lime, caused mortalities as follow:—

TABLE V.—Beetles Destroyed by Arsenical Dusts Cleaned from Legs and Antennae.

Dust.	Highest mortality.	Lowest mortality.	Average mortality.
	Per cent.	Per cent.	Per cent.
Lead arsenate 3 parts, lime 1 part (seven tests with lots of ten beetles)	100	60	80
Lead arsenate 1 part, lime 1 part (fifteen tests with lots of ten beetles)	100	60	80
Lead arsenate 1 part, lime 3 parts (eight tests with lots of ten beetles)	70	20	50
Calcium arsenate 1 part, lime 4 parts (eight tests with lots of ten beetles)	70	40	57·5
Control (untreated)	0	0	0
Hydrated lime	0	0	0
Lime and tobacco dust (equal parts)	0	0	0

Contact Sprays and Dusts.—Certain proprietary extracts of pyrethrum proved reasonably cheap and effective sprays for destruction of the beetles. Pyrethrum powder (one part mixed with lime four parts) gave a 90 per cent. kill, and at a strength of one part with nine parts lime, a 55 per cent. kill. An emulsified kerosene extract of pyrethrum should give a satisfactory kill. A proprietary derris compound was less promising than the pyrethrum preparations, and nicotine dust (2½ per cent.) gave a 10 per cent. kill.

Spray and Dust Injury.

Six applications of dusts and sprays were given at intervals of two days commencing as soon as the plants appeared through the ground. Hydrated lime, calcium arsenate one part and lime four parts, wood ashes, and lime and tobacco dust did not appear to affect growth adversely; Paris green (1 lb. to 100 gals. water) and lead arsenate (3 lb. powder to 50 gals. water) caused etiolation and wrinkling of the leaves and stunting of the plants; lead arsenate (50 per cent. and 25 per cent. in lime), caused leaf burn; nicotine dust (2½ per cent.) excessive distortion and wrinkling of the leaves. On older plants two applications of lead arsenate and Paris green sprays did not cause any severe damage and lead arsenate dust (50 and 25 per cent.) caused only slight damage.

Plant Extra Seed.

It is advisable to allow for the destruction of some of the young plants by sowing extra seed and thinning out at each hoeing. The final thinning out should be made when the plants are commencing to grow runners.

Parasites.

An unidentified Tachinid fly was bred from adult pumpkin beetles collected at Gosford, four out of sixty-nine beetles being infested, a single fly larva occurring in each. A similar fly has been bred from beetles collected at Gunnedah and Maitland.

Summary.

Adults of the pumpkin beetle (*Aulacophora hilaris* Boisd.), commonly lived eight to ten months in the laboratory.

The egg-laying period of a female extended over several months; the average number of eggs laid by a female was 490, the greatest 1,721.

After overwintering in 1931, twelve females laid an average of 284 eggs during the following spring and early summer.

Adults probably hibernate in the field, in captivity the beetle overwintered only in the adult stage.

The average period of development from egg to adult was forty-five days in summer, and seventy-seven days in autumn and spring.

Hydrated lime and lime and tobacco dust (equal parts) were the best dusts for protecting young plants.

On older plants lead arsenate and Paris green sprays had a slight repellent action, but actually did not give satisfactory kills.

Beetles do not readily feed on foliage dusted with arsenicals, but may become poisoned by cleaning themselves of the dust which settles on them when the plants are dusted.

Pyrethrum and its extracts were the most promising of the contact insecticides used.

Students Desirous of Gaining Farm and Station Experience.

A number of students, who will have completed the Hawkesbury Agricultural College Diploma Course in Agriculture at the end of the year, desire to gain further practical experience on farms and stations. These lads, about 19 to 21 years of age, have obtained a thorough grounding in agriculture during the three years' course and can be recommended. Should any farmer or pastoralist desire to obtain the services of any of these lads he should communicate with the Principal, Hawkesbury Agricultural College, Richmond.

Also, during the midsummer vacation (14th December, 1933, to 31st January, 1934, inclusive), certain of the College students are anxious to gain practical experience on approved farms. These students are from about 17 to 20 years of age, and the Principal would be pleased to hear from any farmer or grazier who is able to place one or more of them.

Orchard Notes.

DECEMBER.

C. G. SAVAGE and R. J. BENTON.

Seasonal Cultural Operations.

MOST coastal fruit-growing districts have experienced an unusual amount of rainfall during the spring months of this year. This will result in a greater amount of vegetative growth than usual, and probably the losses due to fungoid diseases will also be greater.

Particularly in soils of a deep, sandy character, advantage should be taken to increase the organic content by permitting weeds to grow and then ploughing them under before they become too difficult to manage. In shallow soils this practice is not advisable, and in such cases it will be necessary to keep the land free of weeds so as to retain as much moisture as possible. Retention of soil moisture is a very important factor in aiding fruit to attain a desirable size.

Re-working Citrus Trees.

Many trees were re-headed in the spring for the purposes of budding into newly forced-out growths in the autumn, or whenever they are large enough.

Where these growths on trees hard cut back have not yet been thinned out, this work should now be carried out. On the arms or limbs remaining, only a limited number of well-spaced growths are required; usually two or three shoots are ample on each limb. When these are large enough—$\frac{3}{8}$ inch in diameter—they may be budded. Usually it is late February or March before such a size is attained, but in favoured localities the shoots may be large enough now, and if buds are inserted at once they will have developed considerably by the end of next autumn.

Pruning Lemon Trees.

Straggling growths on lemon trees may be shortened back now. Trees of an unthrifty character which were severely shortened back in the spring may require some thinning out, by suppression, of many strong shoots. The centres of the trees should be kept well open and the limbs trained, as far as is possible, to grow in a sloping outward direction.

Codling Moth Control.

Compulsory Bandaging in the Bathurst District.

Some little time ago representations were made to the Department on behalf of the fruit-growers in the Bathurst district, urging that steps be taken to enforce the bandaging of pome fruit trees in that locality, with a view of assisting in the control of codling moth.

Pursuant to this request, a proclamation has been issued requiring that all apple, pear, and quince trees growing on the land contained in the parishes of Apsley, Bathurst, Grantham, Malmsbury and Mount Pleasant in the County of Bathurst; the parishes of Duramana, Eskdale, Jedburgh, Kelso, Melrose, Peel and Watton in the county of Roxburgh; and the parish of Langdale in the county of Westmoreland, shall have maintained round the trunk and every limb arising from the ground and every limb arising from the main trunk at a distance of less than 5 inches from the ground, a bandage of twill sacking (*i.e.*, wheat sacking) of a weight of not less than 15 oz. per yard of 26½ inches width, such bandage to be not less than 8 inches in width, to be folded once with the opening of the fold facing downwards, and to be clear of the ground at its lower edge. The bandages shall be maintained on the trees from the 15th day of November in each year, and removed not earlier than the 1st day of June nor later than the 31st day of July in the following year. The bandages shall be examined and all larvae and pupae of codling moth destroyed at intervals not exceeding fourteen days during the period between the 15th day of November in every year and the 21st day of February in the following year, as well as at the time of removing the bandages.

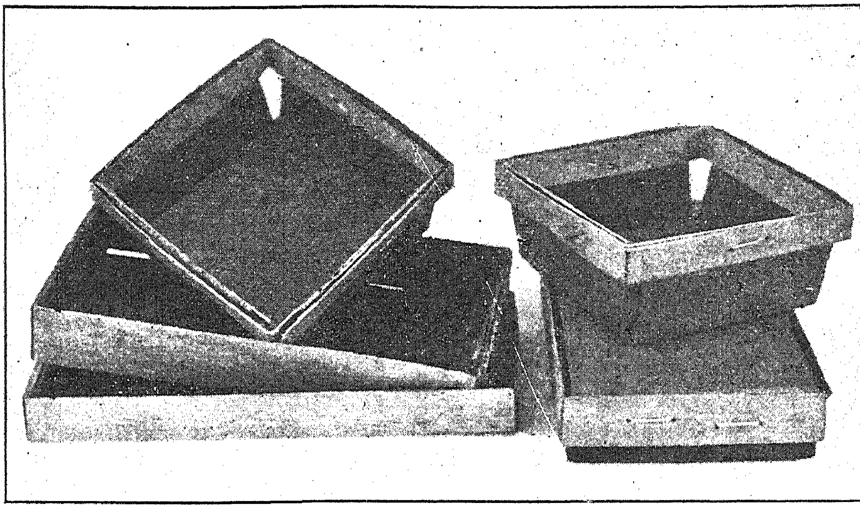
The compulsory bandaging of these trees in the district defined above is, of course, in addition to the conditions already in force requiring the spraying of the trees at specified intervals with arsenate of lead and the destruction of infected fruit. Full details concerning codling moth control are obtainable in leaflet form from the Department, Box 36A, G.P.O., Sydney.

In view of the fact that the bandaging proclamation has been issued at the request of the growers in the district concerned, the Department is confident that the necessary measures will readily be complied with by the majority, but it is pointed out for the information of any who may feel disinclined to co-operate in the commendable effort to secure the greatest possible control of the codling moth pest, that any person who fails to observe the requirements of the proclamation renders himself liable to a penalty of up to £50.

Strawberry Punnets.

THE flat strawberry punnet is gaining in favour. It is easy to understand the popularity of this type of punnet with purchasers. In the first instance, as the strawberries are all in one layer, the consumer can see at a glance exactly what he is buying; there is no fear of "topping." Furthermore, the flat punnet is fitted with a lid and so makes a compact and handy-sized and conveniently-shaped parcel. It is also claimed for the flat punnet that it carries longer distances much better. It seems reasonable, too, that strawberries packed in single layers should be less subject to sweating and other damage during transit.

It should interest New South Wales growers to learn that strawberry punnets, both "flats" and the ordinary type, are now manufactured locally. These compare very favourably with the punnets imported from other States.



Locally-manufactured Strawberry Punnets.

Passion-fruit Culture on the North Coast.

THE passion vine (*Passiflora edulis*), although not indigenous to Australia, has for many years been naturalised on the north coast of New South Wales, and is found, growing in a wild state, as a fairly common plant in the coastal scrubs. It thrives in its adopted (natural) habitat, is comparatively free of diseases, and produces moderate quantities of good quality fruit. The vines establish themselves in the less dense parts of the scrub, their roots being mainly restricted to the thick layers of decayed leaves and humus on the surface and seldom penetrating the underlying soil. They readily lift themselves off the ground and climb over undergrowth and trees as their main means of support.

It is difficult to understand, writes Mr. H. W. Eastwood, Senior Fruit Instructor, in the introduction to his recently-issued booklet on passion-fruit growing on the north coast, why (unless it be on account of diseases) the commercial cultivation of passion fruit in this part of the State has received so little attention in the past and has not been considered worthy of more investigation, for in other less favourable parts of the State the value of the passion for commercial purposes has been recognised for years. Although it is not likely that the passion will assume the same importance as the banana in this district, it is nevertheless worthy of a place among the sub-tropical fruit-producing plants. As yet it is not extensively grown, but it is a source of considerable income to growers who specialise in it.

Recently there has occurred a revival of interest and enthusiasm in regard to the cultivation of this popular fruit, and the Department of Agriculture is receiving constant inquiries for information concerning passion fruit growing. Mr. Eastwood's booklet is so complete that it should meet the requirements of the most exacting. Its fifty odd pages of text are well illustrated and certain chapters on preliminary considerations; bearing and cropping habits; preparation of the land; planting distances and trellising; propagation; transplanting and training; inter-cultivation; pruning; manuring; varieties; replanting and rotation; diseases and pests; picking, grading, packing and marketing; and yields and returns.

Copies of the booklet (Farmers' Bulletin No. 169—"Passion Fruit Culture on the North Coast," by H. W. Eastwood) can be obtained from the Department, Box 36A, G.P.O., Sydney; price, 2s. 1d. posted.

Don't Plant Bananas in Unsuitable Localities.

A NOTE of warning is issued to intending growers of bananas of the necessity of selecting districts that are suitable for the production of high quality fruit. The industry has expanded very rapidly during the last few years, and it is anticipated that production will be greatly increased, consequently the returns per acre from plantations situated in less favoured districts, and even in the better districts in situations that are not suitable for the production of good crops of high quality, will be disappointing.

It has come under the notice of the Department that it is the intention of some growers to plant out large holdings on the lower north coast, in situations that are very cold in winter, and which in some cases are located a considerable distance from the coastline. Growers who intend selecting these areas will do well to consider that the banana is a tropical plant, and success will not be obtained when planted in situations and areas that are subject to intense cold during the winter months.

Before growers decide to plant, they are advised to get into touch with any of the Department's fruit inspectors who are located in the various centres on the North Coast, and who would be pleased to furnish advice as to the suitability or otherwise of the areas for the successful cultivation of bananas.

Miscellaneous Notes.

A New Peach Case.

In addition to the cases previously prescribed under the Fruit Cases Act, a half-bushel case has now been added, which is likely to prove more suitable for peaches than for other fruits.

The internal dimensions of the new case are as follows:—18 inches long by 10¾ inches wide by 5¾ inches deep.

The Fruit Fly Campaign.

Satisfaction is felt by the Department and the New South Wales Fruit-growers' Federation at the results that have so far attended the campaign they are waging against the fruit fly.

By means of coloured posters, the distribution of leaflets and vigilance on the part of the inspectorial staff, orchardists, and other persons with fruit trees have been made to realise more than ever that the fruit fly levies a heavy toll on the industry each year.

There is a substantial penalty for not carrying out the necessary control measures. Just what the fruit-grower—commercial orchardist as well as backyard enthusiast—is required to do by law is clearly set out in a leaflet on fruit flies, which is issued free on application to the Department. Write at once for a copy.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th September, 1933:—

Description.	Imports.	Exports.*
Interstate.	Cases.	Cases.
Fresh Fruit ...	348,002	103,712
Tomatoes ...	114,628	...
Bananas	13,931	21,204
Pines	46,220	9,418
	lb.	lb.
Canned Fruit ...	281,708	...
Dried Fruits—		
Unspecified ...	5,628	...
Currants ...	2,268	...
Raisins ..	3,136	...
Apples ...	1,540	...
Apricots ...	1,764	...
Prunes ...	336	5,992
Pears	1,120	...
Peaches ...	2,324	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	4,967
Bananas ...	....	3,814	...
Lemons ...	....	...	1,918
Oranges ..	....	12	38,546
Grape Fruit ...	....	6	...
Pears	....	...	394
Other	....	135	742
Dried Fruits—		lb.	lb.
Apples ...	....	...	1,967
Apricots ...	....	...	2,524
Currants ..	....	...	62,795
Figs	Turkey	1,328	
Peaches ...	....	...	6,632
Prunes ...	....	...	566,805
Raisins—			
Sultanas ...	....	...	448,671
Lexias ...	....	...	732
Other ..	....	...	2,460
Dates	Iraq	21,290	25,722
	Mesopotamia ..	1,750	...
Other	China	884	...
	Syria	55	...
	....	...	3,227
Preserved in liquid—			
Apricots ...	....	...	325,369
Peaches ...	....	...	741,169
Pears ..	....	...	32,059
Pineapples ...	....	...	232,545
Other ...	....	Gallons. 1,811	101,253

* Exports to Queensland for the quarter are overland only, and those to Tasmania for September are not yet available.

Papaws Grow Well on the Far North Coast.

G. B. BARNETT, Fruit Inspector.

ALTHOUGH the papaw or papaya (*Carica papaya*) is a typical tropical plant, it grows well on the Upper North Coast of New South Wales. It thrives best and produces good quality fruit on our scrub soils, but very satisfactory yields are obtained on the many other types of soil on which bananas are grown, provided the drainage is good (this is essential) and protection is afforded from frosts and winds.

When the conditions are favourable the plant may mature its first crop within twelve months, grow to a height of 15 to 20 feet, and have a commercial life of eight to ten years. As far south as Coff's Harbour the papaw has been recorded on several occasions as maturing fruit of excellent flavour and quality during its eighth month. The most productive period in the life of the plant is the first three or four years, much depending on soil, location, rainfall, and the attention given by the grower.

Male and Female Plants Occur.

According to Popenoe* the papaw is normally diœcious, *i.e.*, with the staminate (male) and pistillate (female) flowers produced on different plants. In addition to the staminate and pistillate forms, intermediate forms have been observed in which flowers of each sex occur in one plant. Staminate flowers may occur with rudimentary stigmas and ovaries which give rise to small worthless fruit, and there is a hermaphodite type, which regularly produces perfect flowers, is self-pollinated, and yields excellent fruits.

Many and varied are the suggestions that have been expounded concerning the determination of sex, but the writer has yet to be convinced by any of these so-called "positive tests," except that the most vigorous plants usually grow up to be males. On account of the uncertainty of determination of the sex when setting out the plants many growers prefer to sow the seed where the plant is to grow to maturity. This is the common practice among banana growers who grow papaws as a sideline, and certainly is to be recommended as the best method of propagation, as the plants do not receive the setback occasioned by transplanting.

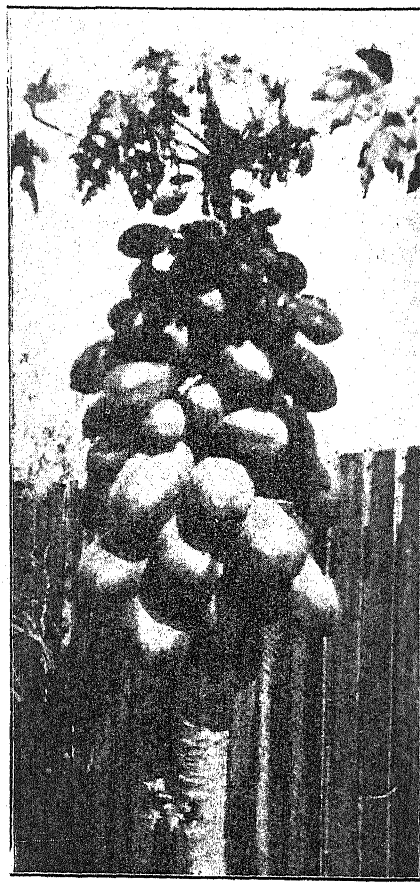
Methods of Propagation.

The papaw can be propagated from seed, cutting, and graft. The only method which is worth while commercially is the raising of seedlings. The usual practice in the banana plantation is to spread the seed of a fresh,

* Manual of Tropical and Sub-tropical Fruits, by Wilson Popenoe.

good-sized, and good-quality fruit selected from a tree known to be a prolific bearer, in rows or circles between the banana stools, and to cover them with a thin layer of soil. The seed will, however, retain its germinating power for several seasons, if washed, dried and stored in an air-tight jar away from direct sunlight.

Where it is desired to sow the seed in boxes or beds, the work should be done in the early spring in prepared soil, covering the seed to a depth of



Papaws growing on the North Coast.
Left.—A twelve-months-old pistillate (female) tree.
Right.—An eight-months-old tree at Coff's Harbour, with mature fruit.
Lower leaves removed to show fruit.

1 inch. Keep the beds or boxes partially shaded during the early propagation period, and maintain the soil in a slightly moist condition. As the plants develop above ground allow them more sunlight in order to harden them off, and when about a foot high they should be ready for planting out.

Avoid the hot midday sun when transplanting. Just prior to planting out give the plants a liberal watering in order to loosen the soil and allow of their being removed with a minimum amount of damage to the roots. The older leaves should be nipped off when the plants are being put out, allowing the leaf-stalk to remain. The plants should be spaced about 6 to 8 feet apart, and, if in rows, about 10 feet should be allowed between the rows.

The most successful method to adopt when raising plants from cuttings is to pull off the short side branches that develop on most old trees, taking care that the corm-like portion at the junction of the small branch and parent tree comes away attached to the branch. Cut off all large leaf-stems to within a few inches of the branch, and smooth off the rough surface at the basal end with a knife. Plant the cutting in a shady position in a soil of sandy loam, and keep soil slightly moist.

A Tree of the Natural Branching Habit strain.

The papaw has been grafted successfully in different parts of the world, but it is recorded that the life of the worked tree is short, and in a year or two it becomes stunted and produces inferior fruit.

Although most strains of the papaw develop the branching habit, there are some that retain the single stem. To encourage branching it is customary to nip out the terminal growth when the tree is one year old. In vigorous-growing trees this increases the bearing surface and tends to dwarf, thus facilitating harvest operations. This topping can also be done earlier in the tree's life. Because of the possibility of causing decay, the cut should be covered with wax, paint, or some other weather-resisting material.

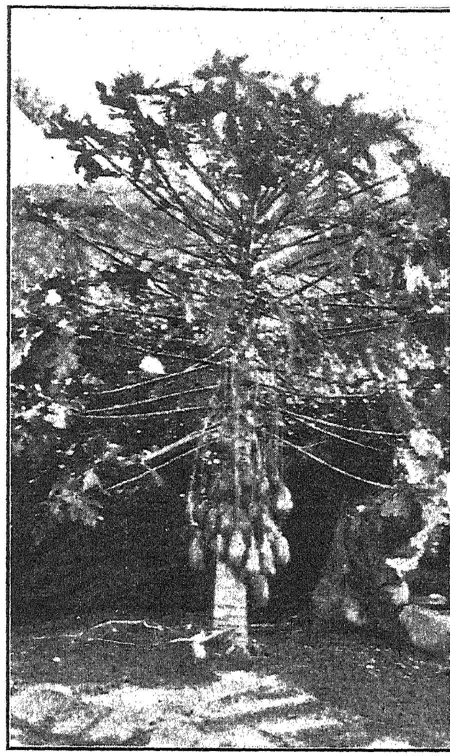
Manuring.

It has been found that applications of farmyard manure in July and November are of value in prolonging the productive life of the trees, and that a mixture of superphosphate (three parts), sulphate of ammonia (one

part), and sulphate of potash (one and a half parts), applied at the rate of 2 lb. per tree, will promote tree growth, which is essential to good quality fruit.

The Harvesting of the Fruit.

Great care is necessary in harvesting and packing for market, as the fruit is very easily marked and bruised. Much of the bruising that occurs at harvesting time can be eliminated if the picker will hold the calyx end firmly in the palm of the hand, and with the fingers give the fruit a gentle twist, when the stalk will break from the plant. The longer the fruit is allowed to hang on the tree the better is the quality and flavour, but after reaching a certain stage of maturity its carrying qualities are impaired. The proper stage of maturity at which to harvest depends on the nearness of the market, but the North Coast grower will find that for the Sydney market the best stage is when the calyx end is changing to a yellow colour.



A Prolific Staminate Tree, many of the Flowers being Perfect.
Note how the fruit hangs on long stems.

When packing, the case should be lined with a layer of either wood-wool, grass, or crumpled paper on the bottom and top, while the fruit should be liberally wrapped with paper.

For eating, the papaw should be cut in half, the seeds scraped out, and sugar, salt, orange or lemon juice applied to the flesh. This fruit is becoming increasingly popular in our cafes for serving with ice-cream. The green fruit may be cooked and served as one would a vegetable marrow, or it can be used for making chutney.

For commercial purposes the long-shaped fruit type is recommended, on account of its suitability for packing purposes and its popularity amongst city consumers. This does not imply that all long type strains are best for market, for some of our elongated strains, although possessing excellent flavour, have very poor carrying qualities, having thin skin and soft flesh.

Pests and Diseases.

The papaw is comparatively free from pests and diseases in this State. The major loss of fruit is from rots which develop at the calyx and exposed

side of the fruit, and which only appear during unusual climatic conditions. These diseases can be controlled by an application of Bordeaux mixture, but seldom is the infection serious enough to warrant spray measures.

Reasons for Crop Failures.

Crop failure, or fruit developing towards maturity and then falling from the tree, may be the result of the blossom being attacked by insects or disease, or unfavourable soil or climatic conditions at fruit setting stage, but where these conditions do not prevail it is quite possible that pollination is at fault. The shrivelling and dropping of fruit from the staminate (male) tree is common, and if an inspection is made of the interior of the fruit it will be found that the seed is undeveloped. Infertile fruit is usually insipid in flavour and the flesh is thin and leathery.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1932 budding season, trees from which should be available for planting during the 1933 planting season :—

Nurseryman.	Oranges.		Eureka Lemon.	Marsh Grape-fruit.	Total.
	Washington Navel.	Valencia.			
L. P. Rosen and Son, Carlingford...	4,000	4,000	1,000	1,000	10,000
T. Adamson, Ermington	1,500	1,500	500	250	3,750
A. T. Eyles, Rydalmere	2,000	1,000	...	...	3,000
H. J. Ferguson, Wyong	...	200	...	...	200

—C. G. SAVAGE, Director of Fruit Culture.

OWING to quarantine restrictions which are in force in Queensland, sugar-cane from New South Wales is not permitted to enter that State unless accompanied by a permit from the Director, Bureau of Sugar Experiment Stations, Brisbane.

Some Common Internal Parasites of Sheep and Cattle.

A Knowledge of Their Life-histories Important.

R. O. C. KING, B.V.Sc., Veterinary Research Officer.

In the efficient control of any parasitic disease it is of great importance to know the mode of life of the parasite and the way in which it is reproduced from generation to generation. In a recent broadcast address Mr. King outlined briefly the life histories of certain of the various internal parasites which infest sheep and cattle in New South Wales. This address is printed in the following pages.

Stomach and Intestinal Round Worms.

THE twisted wire worm, *Haemonchus contortus*, will serve as a typical example of this group. This worm very commonly inhabits the fourth stomach and small intestine of ruminants, and a female worm may lay as many as 10,000 eggs per day. These eggs pass out on to the pastures in the animal's droppings. If the droppings fall on to hard dry surfaces, such as yards, roads or hard dry earth, during drought periods they dry up and thousands of the eggs die. If, on the other hand, the droppings fall on to pasture moist with rain or dew they do not dry and inside each egg a tiny baby worm develops. The eggs hatch in about twenty-four hours in summer and the baby worms live in the dung, growing all the time.

Within about four days (in summer) these baby worms have reached their full growth outside the animal body and have developed an entirely new skin. The old skin is not cast off, however, but is retained as an extra covering which acts as a protection from harmful external conditions, such as excessive heat, cold and dryness, and extends the time for which the parasites can live in the open. The baby worms now leave the dung in which they have grown and crawl on to tufts of grass. If the grass is wet by rain or dew and the light not too strong, as in the morning and evening or on a cloudy day, they can climb up the blades of grass just as a snail can crawl along a moist garden path. They retreat into the base of the tufts, however, as the moisture dries and the sunlight strengthens. Here they are protected to some extent from heat and the direct rays of the sun. In summer, as I have said, this stage of development may be completed within four days. In winter, of course, the time taken is much longer.

Many of these baby worms die a natural death from varying adverse conditions, such as excessive heat, dryness, exposure to the direct rays of the sun, excessive cold in winter, etc., and nature has provided for this by the enormous numbers of eggs which are laid by the female worms in the sheep and cow. This prolific production of eggs ensures that sufficient baby

worms survive to continue the species in spite of unfavourable conditions. Under moderate weather conditions, however, the fully developed baby worms protected by their old skins may live for up to nine months.

To reach maturity these baby worms must be swallowed by a sheep or cow as it grazes over the pasture. When this happens the parasites pass to the paunch with the chewed-up grass. They are about one-fiftieth part of an inch long, so you can see that there is little chance of their being destroyed while the sheep or cow is chewing its food. The baby worms now pass on through the second and third stomachs and reach the fourth stomach and grow rapidly, reaching their full development in about fifteen days from the time they were swallowed. They are now fully developed male and female worms, and the female worms start to lay eggs on about the twentieth day of their life in the animal, and so the cycle goes on.

Drenching a Sheep by means of a Syringe.

It will thus be seen that the whole life cycle from the eggs, through the various larval stages to the mature egg-laying worms, may be completed, under the most favourable conditions, within less than thirty days.

The Small Hair Worms.

The small hair worms, of which there are several species inhabiting the stomach and intestine of sheep and cattle, are much smaller than the twisted wire worm, but follow the same general course during their development. The eggs pass out on to the pastures, hatch, the baby worms undergo development, are swallowed by a sheep or cow and proceed to the mature stage of development in a similar manner to *Haemonchus*.

A few of these worms in the stomach or intestine will not do an animal any appreciable harm, but if, as frequently happens, they are present in large numbers they suck the blood of the sheep or cow and cause marked anaemia and wasting. The affected animals become weak and thin and in extreme cases die from the attack of the parasites. To give you some idea of the number of worms which may be present in heavy infestations I may say that from 20,000 to 40,000 small hair worms have been recovered from the small intestines of a lamb in a badly infested flock.

The Nodule Worm.

Passing now to the nodule worm, *Oesophagostomum*, we find that its life history is similar until the baby worms, after being swallowed, reach the fourth stomach. Instead of living and growing in the stomach and bowel contents the baby worms of this parasite bore their way into the lining of the intestine and there form small nests, or nodules. Here they remain for about a week and then return to the intestine where they become mature within about thirty days from the time they were swallowed.

The best conditions for the development of these stomach and intestinal worms are warmth and moisture, so that the moist borders of any marshy creeks, swamps or soaks on a property are the places where the baby parasites will develop most quickly and live longest, and the warm weather of the spring, summer and autumn is the time during which they make most rapid growth. Thus sheep and cattle will be most heavily parasitised during a wet summer.

This type of life history is known as direct development because the baby worms pass from one animal to another of the same species without passing through an intermediate host.

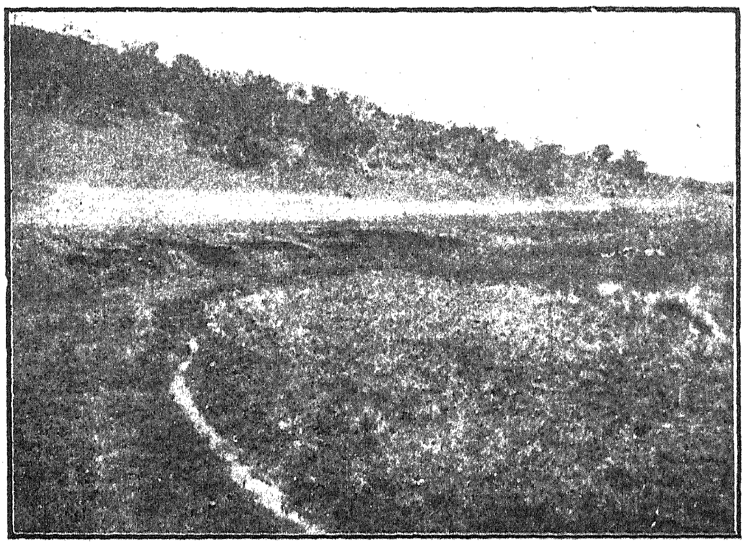
The Liver Fluke.

The liver fluke (*Fasciola hepatica*) of sheep and cattle is an example of a worm whose development is indirect; that is, one which is, in turn, a parasite of two animals of different species before it reaches maturity.

This worm lives in the bile ducts of its hosts where, like other worms, it lays eggs. These eggs pass out on to the pastures in the droppings, but do not hatch unless they come in contact with water. If the eggs fall into a swamp or stream they hatch in about eleven days, liberating a small baby worm which can swim actively. This baby worm swims around in the water until it comes in contact with a little water snail of a definite species (not every snail will do), when it bores into the snail's body and makes its way to the liver, situated at the top of the snail's shell. Here it grows for about one month and then it leaves the snail, having completely changed its original appearance. It now is recognisable as a baby fluke, but possesses a tail with which it can swim actively in water, in fact, when examined under the microscope, it is not unlike a tadpole. It now swims around till it makes contact with a blade of grass growing in the swamp or on the bank of the creek. When it reaches a blade of grass it adheres to it,

sheds its tail and secretes a shell around itself. This shell serves to protect it from adverse external conditions just as the old skin protects the baby stomach worm.

Development will not proceed any further unless the blade of grass on which the baby fluke has formed his shell is eaten by a sheep or cow. When this occurs the shell is dissolved by the digestive juices of the small intestine and the baby fluke liberated. It then bores through the intestine and falls into the abdominal cavity through which it makes its way to the surface of the liver. Reaching the liver it bores into the substance of this organ, and eventually reaches a bile duct; it fastens to the wall of the duct and grows to maturity in about two months. The whole cycle from egg to mature fluke may be passed through in about four months.



Draining of Swampy Places is an important part of the control of Fluke.
The area to the right of the drain shown above has been made firm and dry, thus reducing the area habitable by the snail.

The liver fluke harms the sheep or cow in two ways. Firstly, the baby flukes, boring their way through the liver damage that organ very considerably, and when a large number of baby flukes are present in the liver at one time they may actually kill the animal. Even if they do not kill the animal they cause severe illness. Secondly, the mature flukes living in the bile ducts of the liver suck blood from the lining of the ducts, thus draining the animal's resources. Also their presence in the ducts sets up an inflammation which damages the liver to a considerable extent. Thus we have two distinct types of illness caused by the fluke. One, an acute illness, resulting frequently in sudden death, and the other, a chronic illness, resulting in anaemia, loss of condition, harsh wool in sheep, etc., these eventually ending in the death of the animals after a long illness.

The liver fluke is a parasite which passes its adult life in the sheep or cow and its baby life in the snail.

The Hydatid.

A parasite which passes its baby life in the sheep and cow, but its adult life in another animal, is the hydatid. The adult of this parasite is a tapeworm of the dog. Most tapeworms are many inches long, and composed of hundreds of segments, but this little fellow is composed of only four segments and is about one-quarter of an inch long. The eggs of this worm pass out from the dog and lie on the pastures until picked up by a sheep or cow. The egg hatches in the intestine, freeing a baby tapeworm which bores through the wall of the intestine and is carried by the blood stream, usually to the liver or lung. In these organs the baby tapeworm lodges and a white bladder-like structure filled with fluid develops from it. This bladder is called an hydatid cyst. Within this cyst small white bodies about the size of a grain of sand develop. Each of these small bodies is the head of a future tapeworm.

A Dangerous Practice.

The feeding of raw organs of sheep or cattle to dogs is the means by which they become infested with the hydatid tapeworm.

These hydatids may be found in almost any part of the body, but most commonly occur in the liver and lung. For the worm to develop to maturity it is necessary that a dog should now eat the hydatid cyst occurring in the sheep or cow. If this happens the tapeworm heads escape from the hydatid cyst, attach to the dog's intestine and grow to maturity.

Hydatids in Man.

Hydatids rarely, if ever, cause the death of sheep or cattle, but this disease is important from its relation to public health. Human beings develop hydatids in exactly the same way as sheep and cattle, that is, by their food becoming contaminated by the tapeworm eggs voided by a dog.

We know the weak point in the cycle; if the dog is never allowed to eat the hydatid cyst it will never develop the adult tapeworm and become a danger to human beings. It, therefore, is of the utmost importance never to allow dogs to eat any raw offal, such as livers or lungs, when animals are slaughtered for food on the farm or station. The prevention of hydatid disease in cities is part of the duty of the trained meat inspection staff of abattoirs and is ensured by the destruction of all organs affected by the disease.

There are two other tapeworms of the dog which pass their baby life in the sheep or cow. These also form bladder-like structures in the herbivorous animal, but they are found either on the shiny membrane lining the abdominal cavity and its organs or embedded in the muscle of the heart. Their development is similar to that of the hydatid, but they will not develop in the human being, and each cyst only contains one tapeworm head.

Adult tapeworms do occur in the sheep and cow, but their life history is, as yet, not completely known. There is some evidence to suggest that their development is direct, no intermediate animal being required for transmission of the tapeworm from sheep to sheep or cow to cow, but this has never definitely been proved.

Study of the Life-history Enables Prevention.

From this short description of the life cycles of the various parasites you will understand the importance of this knowledge in combating these enemies of stock. If we know the complete life cycle of any parasite it is often possible to find a weak point in the cycle, and by adopting a definite line of attack we are enabled to prevent the development of the baby worms.

You have seen that by never feeding dogs raw offal containing hydatid cysts the danger of animals and human beings becoming infected is removed. In the same way, if we destroy the particular snail in which the baby fluke develops we can prevent the reproduction of the adults, and if we treat sheep and cattle regularly for stomach and intestinal round-worms we can kill the baby worms before they develop to maturity and commence to lay eggs. In this way our present knowledge can be utilised to great advantage to maintain health and prevent disease in stock, and further research into those life histories as yet not completely understood will increase our ability to prevent disease. It is infinitely better to keep your stock free from disease than to attempt to cure disease which has gained a footing in your flock or herd.

[Note.—Leaflets on most of the common diseases and pests of stock are available, free of charge, from the Department, Box 36A, G.P.O., Sydney. Write and mention the diseases in which you are interested, or ask for a copy of the "List of Publications."]

Dry milking *versus* wet milking is often a debated point, but the practice of drawing a little milk into the bucket and dipping the fingers therein is undoubtedly most insanitary.

Dairying Notes.

DECEMBER.

Big Holsteins, Big Yields.

WEIGHT in Holstein dairy cows should not be mistaken for beef type, writes Dr. H. Epstein, D.Agr., a South African authority. No Holstein breeder wants beef, but he wants heavy, large-framed animals. He wants these, not because they carry large quantities of flesh, but because they are the biggest and most economical milk producers.

Holsteins on a South Coast Pasture.

One of the world's biggest Holstein cattle breeders' associations has compared the records of a large number of its highest producers to their body weights.

Average live weight per cow.	Average milk production.
Over 1,540 lb.	20,880 lb.
1,430-1,540 lb.	19,745 lb.
1,320-1,430 lb.	20,024 lb.
Under 1,320 lb.	17,668 lb.

The heavier cows have proved superior to the lighter ones as far as milk production is concerned, a fact which has been experienced in the United States as well.

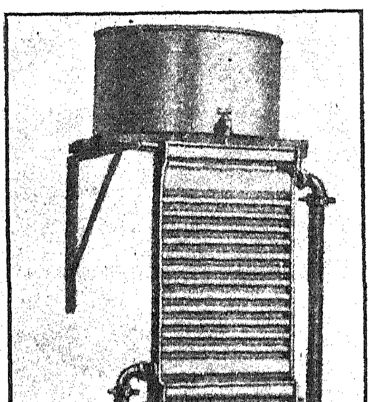
But the heavier cow also needs less feeding for a certain amount of milk, a point which should be of the greatest interest to dairymen. One hundred pounds weight of starch equivalent enabled cows of—

Over 1,540 lb. to produce 202.4 lb. milk (4 per cent. test).
1,430-1,540 lb. to produce 204.3 lb. milk (4 per cent. test).
1,320-1,430 lb. to produce 200.9 lb. milk (4 per cent. test).
Under 1,320 lb. to produce 177.6 lb. milk (4 per cent. cent.).

Holsteins of the heavy type are, according to these extensive tests, not only the biggest, but also the most economical producers. In other words, the light, fine, old-fashioned dairy type in Holsteins is uneconomical in comparison with the heavy, strong, broad and deep-set modern dairy type.

Wash the Hands After Milking Each Cow.

DAIRYMEN who milk with dirty hands should consider the effects their slovenliness might have, not only on dairy products, but on their fellow-beings. Often this carelessness is due not to lack of personal cleanliness, but to want of knowledge of bacterial life. Let every dairyman have a look at his hands when dirty, and ask himself if he would like to see the baker from whom he buys his bread kneading his dough with hands in similar condition. He would say that such a baker was a dirty person, perhaps even use stronger language. Yet bread is subjected to a temperature in the oven high enough to kill the organisms, whilst milk is generally consumed in the raw state.



A Milk Cooler.
Suitable for use in can room adjoining cow-bails so that freshly drawn milk can be cooled immediately.

After the milking of each cow the milker should wash his hands in clean water and dry them; if this is not done there may be bacteria in the liquid on the hands that will gain access to the milk in the bucket. It is unnecessary to defend washing on the score that any time expended on it is subsequently made up, for even if the time were actually time lost its expenditure would still be well worth while. It is contended, however, that any time occupied in washing the hands is made up eventually by reason of the water's stimulating effect on the hands of the milker. As a shower invigorates a tired body, so does a wash invigorate the milker's tired hands and wrists. Supposing that fifteen seconds is taken up in washing the milker's hands and the udder in the case of each cow, and that one milker milks sixteen cows at a sitting, this would mean a total loss of about four minutes, and the increased speed of milking would

easily make up this time. Moreover, as every dairyman knows, the more actively the milking is done the more the activity of the milk-secreting cells is stimulated, hence more milk of better quality.

Lime-water for Calves.

BESIDES being a necessary mineral constituent for all classes of animals, lime acts also in correcting acidity in the stomach. It also renders the curd portion of milk more readily digestible, particularly by young calves.

Lime-water of the requisite strength is easily made on the farm. There need be no fear of making it too strong, as water will only dissolve a certain limited amount of lime—½ grain to the ounce, or 10 grains to the pint. Add a bucketful (say, 20 lb.) of lime to about 10 gallons of water in a wooden barrel, stir well, and allow to settle. The clear liquid resulting can be used, and water added and stirred daily until all the soluble portion of the lime has dissolved—the lack of alkaline flavour will indicate when this point has been reached, and a fresh supply of lime should be added to the barrel.

When the young calf is changed over from a diet of whole milk to one of skim milk, some form of concentrate should be added to replace the butter-fat that has been removed in separating. Experience has shown that an excellent addition is a thick gruel made from 3 lb. of crushed linseed and 2 lb. pollard, carefully stirred into 3½ or 4 gallons of water, and slowly boiled for at least half an hour. One pint of this should be added to each gallon of pasteurised skim milk, also one wineglass (2 oz.) of lime-water.

This gruel should be added in small quantities at first, so that the calf may become acquainted with the flavour, also so that its digestive system may adapt itself to a new class of food. If fed in full quantity at first the animal may either refuse the food or will be rather severely scoured by it.

The Complexities of Correct Feeding.

ABOUT twenty-seven years ago the theory of a balanced ration was hailed as a complete basis for scientific feeding, said Mr. G. F. Shirley, addressing South Coast dairy farmers on the occasion of the eighth annual conference of the Illawarra District Agricultural Bureau, but when the wide differences of results obtainable from a variety of theoretically balanced rations were noted, it became apparent that the idea of balancing a ration did not go far enough and the closer study of the mineral structure of foodstuffs became necessary. Still closer study and experiment directed attention to the fact that the mere presence of all the mineral essentials in a food did not always crown the mixture with success. Theoretically perfect combinations were evolved, upon which, however, animals languished and died unless some milk or some green matter was added. It was the study of this "mysterious something" that permitted the assimilation of essentials, that first evolved the idea of vitamins.

Since the first discovery of the presence of vitamins we have learnt that there are many different kinds—each with a particular function of its own to aid in the assimilation of different kinds of substances. Thus we have a vitamin that aids the absorption of lime by the body; another that aids the absorption of fats, and so on. The most recent vitamin that has been discovered is one that has a very marked effect upon fertility, and its application has had the effect of rendering many hitherto sterile animals fertile.

A cow that is on good Australian pasture will consume 110 to 120 lb. of grass per day, which would supply to her body about 23 lb. of dry matter and about 8 gallons of water. Provided the pasture contains a reasonable amount of mineral matter a cow fed on these pastures is being fed with enough material to make between 2 to 2½ gallons of milk per day according to the thriftiness of the animal.

You will realise that upon ordinary good pasture of this kind, a cow that is giving over, say, 2 to 2½ gallons per day requires an extra amount of milk-making material to prevent her robbing her system. As she cannot eat any more grass, it stands to reason that if our breeders cannot supply us with a cow with a much larger stomach, then we must supply portion of her food in a more concentrated form.

In making up combinations of concentrates and roughages it is as well to remember there are, unfortunately, very few foods that alone are able to supply a full range of all necessary essentials, and therefore the most satisfactory rations must, of necessity, include in their make-up a fair variety of foods from different plants. Care should be taken to avoid choosing roughages and concentrates that are derived from "the one stalk," as, for instance, wheaten chaff and bran, corn silage and ground maize meal, green oats and ground oatmeal, etc. The same idea can be extended to cover the undesirability of combining two substances that are deficient in the same essential, such as, for instance, maize meal and bran, both of which are lacking in lime.

The same principles apply in the growing of crops and explain the remarkably superior results obtained from feeding a crop of oats that has been mixed with a certain percentage of legumes such as peas, vetches, tares, etc., in order to make up for the deficiencies in the composition of the oats, or, say, a crop of green maize that has been mixed with either soy beans or lucerne to correct the same defect.

Factors Affecting Milk Yield.

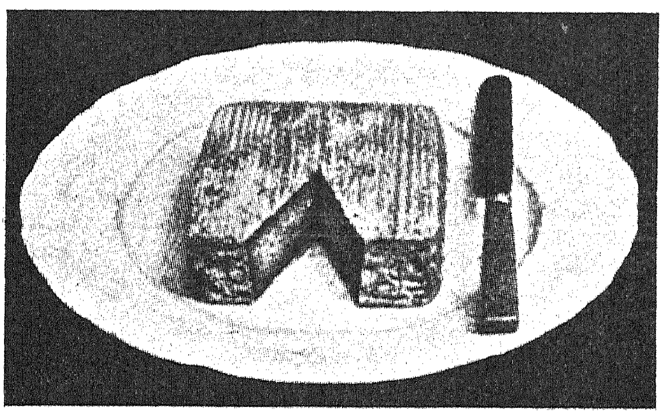
A STATISTICAL analysis of data from milk recording societies has disclosed what are the principal factors which affect milk yield. The increased yield which follows the first growth of the grass in the spring has led to investigations which show that it is traceable to the high protein and low fibre content in the herbage at this season. The yield is also affected considerably

by the age of the cow, the length of her dry period, and the time which elapses after calving before she is served. Studies of the growth of the udder have shown that it commences at the twentieth week of pregnancy, at which time, if the cow is already in milk, the yield begins to decrease rapidly. Since the udder cannot both produce milk and develop its maximum growth, one or both functions must suffer. Cows which are milked up to the time of calving yield accordingly much less milk during the next lactation period, a dry interval of forty to sixty days being required in order to produce full growth of udder tissue for the next lactation. The feeding of cows on a milk-producing ration during this period considerably increases the udder growth and consequently the milk yield during the following season.

The foregoing is an extract from "A Conspectus of Recent Agricultural Research," which is the title of the N.Z. Cawthron Lecture for 1932, delivered by Lord Bledisloe, Governor-General of New Zealand.

How to Make Sour-milk Cheese.

THE housewife often finds that milk goes sour, but it need not be wasted, for it can be utilised in the making of sour-milk cheese. If it is not thick, add a few drops of rennet (if in a clot there is no need to add the rennet).



Pont l'Evique Cheese.

Pour the thick milk carefully into a huckabuck towel, tie the ends of the cloth together, and hang up so as to allow the whey to drain off. When the curd is dry it should be passed through a mincer along with a small quantity of ripened cheese. Salt is then added to taste, and also a little pepper and mustard, and the whole is then passed through the mincer again, and finally put into a jar, which is made air-tight. The cheese will be ready for consumption in about two weeks, and can either be used in the ordinary way or in the making of savouries, such as macaroni and cheese.

To the person with a few cows the making of Caerphilly, Port du Salut, and Brick cheese is recommended, while for those with only one or two cows, Port du Salut, Pont l'Evique, or Gervais cheesemaking should be an economical proposition.

How to make these and other kinds of cheese is fully dealt with in the booklet entitled "Cheesemaking" (Farmers' Bulletin No. 141), the third edition of which was recently issued by the Department. Price, 1s. 1d. posted.

The Site for the Piggery.

Treating with this subject in a leaflet on pig-raising, Mr. A. F. Gray, Senior Piggery Instructor, directs attention to the fact that the regulations under the Dairies Supervision Act lay down that pigs shall not be kept nearer than 50 yards from any milk room, bail, or yard. Apart from legal obligations, there are several other points to be considered when choosing a site for the piggery. In the first place, the site on which the piggery is to be located should lend itself to being effectively drained. It should have a gentle slope, without being steep, and if the aspect is to the east, it will be so much the better in the greater part of the State. The drainage should be of a surface kind, the result of the fall or slope, and should not depend upon underground drains, which are apt to get choked up and can never be kept in the same sanitary condition as those to which the sunlight has access.

If there is a piece of rough ground on the farm that is conveniently situated and otherwise satisfactory it may be very suitable for the piggery. Regard must be had, too, for the position of the residence, for if the prevailing winds carry the smell of the piggery to the dwelling, one or other will probably have to be moved quite soon.

Light, absorbent sandy loams are preferable to stiff clays or soils with a clay subsoil. Clays are apt to become saturated with offensive matter in time, and thus to give rise to unhealthy conditions, especially during wet weather. Where there is a good fall, however, clays are less objectionable.

Readers are invited to write to the Department for a copy of the leaflet on pig-raising, also for the one entitled "The Bacon Pig," by the same author. There is no charge for these publications.

Whilst on the subject of pigs, it is hoped in a subsequent issue of this Gazette to publish complete plans and specifications of the lay-out of a piggery.

In the final official forecast of the current season's wheat crop for New South Wales, the Director of Marketing (Mr. A. A. Watson) estimates that the area to be harvested for grain will be 4,300,027 acres, yielding 49,046,000 bushels, or an average of 11.4 bushels per acre.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry Date.
Lunacy Department, Parramatta Mental Hospital	12	1 Dec., 1933
Stace Bros., Taylor-street, Armidale	26	1 ,, 1933
Department of Education, Gosford Farm Homes	38	2 ,, 1933
Department of Education, Brush Farm, Eastwood	8	3 ,, 1933
Lunacy Department, Morisset Mental Hospital	29	7 ,, 1933
W. W. Martin, "Narooma," Urana-road, Wagga...	150	14 ,, 1933
J. F. Chaffey, Glen Innes (Ayrshires)	58	15 ,, 1933
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1933
A. Shaw, "Ardshiel," Craven Creek, Barrington (Milking Shorthorns) ...	100	20 ,, 1933
Lunacy Department, Callan Park Mental Hospital	31	20 ,, 1933
W. E. J. Goodwin, Wybong-road, Muswellbrook	40	22 ,, 1933
Chapman Bros., Farm 166, Stoney Point, Leeton	73	25 ,, 1933
E. S. Cameron, Big Plain, Narrandera	31	26 ,, 1933
C. J. Parbery, Allawah, Bega	142	8 Jan., 1934
Strickland Convalescent Hospital for Women, "Carrara," Rose Bay	8	9 ,, 1934
G. H. Hooper, Oak Hill, Bethungra	10	19 ,, 1934
H. A. Corderoy, Wyuna Park, Barrington, via Gloucester (Guernseys) ...	81	22 ,, 1934
A. L. Logue, Thornboro, Muswellbrook	45	25 ,, 1934
F. C. Harcombe, Hillcrest Farm, Warialda-road, Inverell	13	27 ,, 1934
J. B. Burtenshaw, "Sunnyside," Inverell	42	27 ,, 1934
Parker Bros., Hampton Court Dairy, Inverell	82	27 ,, 1934
New England Experiment Farm, Glen Innes (Ayrshires)	41	28 ,, 1934
Bathurst Experiment Farm (Jerseys)	31	1 Feb., 1934
W. K. Frizell, Rosenstein Dairy, Inverell	37	2 ,, 1934
W. Pigg, Redlands Dairy, Inverell	27	2 ,, 1934
A. N. de Fraine, Happy Valley Dairy, Inverell	28	3 ,, 1934
G. L. Genge, "Easton," Armidale	39	7 ,, 1934
J. Davies, Puen Buen, Scone (Jerseys)	257	9 ,, 1934
Forster & Sons, Abington, Armidale	190	12 ,, 1934
Newington State Hospital and Home	91	16 ,, 1934
A. B. Finney, Fox Ground, Gerringong	33	17 ,, 1934
Lidcombe State Hospital and Home	153	20 ,, 1934
Lunacy Department, Gladesville Mental Hospital	34	22 ,, 1934
Riverina Welfare Farm, Yanco	89	24 ,, 1934
Department of Education, Yanco Agricultural High School	39	24 ,, 1934
W. J. Miller, 199 Mann-street, Armidale	8	6 Mar., 1934
New England Girls' Grammar School, Armidale	41	8 ,, 1934
F. C. Butler, Yarranung, Bega	122	24 ,, 1934
G. W. Young, "Boorganna," via Wingham	39	30 ,, 1934
Hawkesbury Agricultural College, Richmond (Jerseys)	118	3 April, 1934
A. D. Frater, "Fairview Dairy," Inverell	61	5 ,, 1934
Cowra Experiment Farm	26	27 ,, 1934
St. Joseph's Girls Orphanage, Kenmore	10	4 May, 1934
G. A. Parish, Jerseyland, Berry	93	5 ,, 1934
Marion Hill Convent of Mercy, Goulburn	27	5 ,, 1934
St. Joseph's Convent, Reynold-street, Goulburn	4	5 ,, 1934
St. John's Boys' Orphanage, Goulburn	18	5 ,, 1934
W. M. McLean, Five Islands Road, Unanderra	76	6 ,, 1934
Koyong School, Moss Vale	3	8 ,, 1934
Miss N. C. Brenan, Arankamp, Bowral	15	10 ,, 1934
Tudor House School, Moss Vale	21	13 ,, 1934
Limond Bros., Morisset	38	1 June, 1934
Navua Ltd., Grose Wold, via Richmond (Jerseys)	20	2 ,, 1934
Hurlstone Agricultural High School, Glenfield	44	22 ,, 1934
Berry Experiment Farm, Berry	145	13 July, 1934
Grafton Experiment Farm	271	14 ,, 1934
Australian Missionary College, Cooranbong	62	19 ,, 1934
William Thompson Masonic School, Baulkham Hills	97	20 ,, 1934
A. A. Campbell, Breadalbane, Mullumbimby	51	16 Aug., 1934
P. Ubrihien, Corridgeree, Bega	129	17 ,, 1934
E. W. Flower, Binna Burra	66	17 ,, 1934
E. C. Nicholson, Jillamatong, Corowa	137	20 Sept., 1934
St. Patrick's College, Goulburn	8	21 ,, 1934
C. Wilton, Muswellbrook	63	21 ,, 1934
S. L. Wills, Greendale Dairy, Cowra	28	27 ,, 1934
Wagga Experiment Farm (Jerseys)...	65	25 Oct., 1934
G. Powell and Sons, "Loch Lomond," Armidale	22	29 Oct., 1934
Riverstone Meat Co., Riverstone Meat Works, Riverstone	92	9 Nov., 1934
Wolaroi College, Orange	11	10 ,, 1934

TUBERCLE-FREE HERDS—*continued.*

Owner and Address.	Number tested.	Expiry date.
J. L. W. Barton, Wallerawang	16	17 „ 1934
Wollongbar Experiment Farm, Lismore (Guernseys)	123	11 Jan., 1935
George Rose, Aylmerton	2	21 Feb., 1935
Mittagong Farm Homes	36	22 „ 1935
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	19	23 „ 1935
T. H. Maples, Racecourse Farm, Bega	48	2 Mar., 1935
P. M. Burtenshaw, Killean, Inverell	63	28 „ 1935
J. P. McQuillan, Bethungra Hotel, Bethungra	25	4 April, 1935
W. Newcomb, "Minnamurra," Inverell	85	6 „ 1935
Lunacy Department, Kenmore Mental Hospital	84	4 May, 1935
St. Michael's Novitiate, Goulburn	4	4 „ 1935
Rydalmere Mental Hospital	65	11 „ 1935
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	261	28 June, 1935
St. John's College, Woodlawn, Lismore	35	29 „ 1935
W. S. Turnbull, Flanders Avenue, Muswellbrook	37	28 July, 1935
Sacred Heart Convent, Bowral	13	3 Aug., 1935
E. P. Perry, Nundorah, Parkville (Guernseys)	23	13 Sept., 1935
James McCormack, Tumut	81	28 „ 1935
E. E. McMullen, Springnook, Holbrook	37	9 Nov., 1935
C. Maynard, Holbrook	12	9 „ 1935

Municipalities Declared Tubercle-free.

The following municipalities have been declared tubercle-free areas and no cattle are allowed to be kept within the municipal boundaries unless subjected to the tuberculin test and found free from tuberculosis:—

Municipality of Queanbeyan.
Municipality of Muswellbrook.
Municipality of Inverell.

—MAX HENRY, Chief Veterinary Surgeon.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion free.

Owner and Address.	Number in herd.
Cann, H. J., The Gap, Alstonville	...
East, N. A. L., East Valley, Gum Flat, via Inverell	51
Hawk, J. T., Ben Lomond	42
Henderson and Son, Upper Wantagong, Holbrook	95
Martin Bros., "Narooma," Urana Road, Wagga Wagga	86
Mott, T., Main Arm, Mullumbimby	26
Ralston, G. V., "Porphyry," Seaham	76
Sams, C. R., Wilson's Creek, Mullumbimby	34
Walker, Jas. R., "Strathdoon," Wolseley Park	32
White, F. J., and Sons, Bald Blair, Guyra	238

—MAX HENRY, Chief Veterinary Surgeon.

INFECTIOUS DISEASES REPORTED IN OCTOBER.

The following outbreaks of the more important infectious diseases were reported during the month of October, 1933:—

Anthrax	Nil.
Blackleg	3
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	5
Swine fever...	Nil.
Contagious pneumonia	2
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

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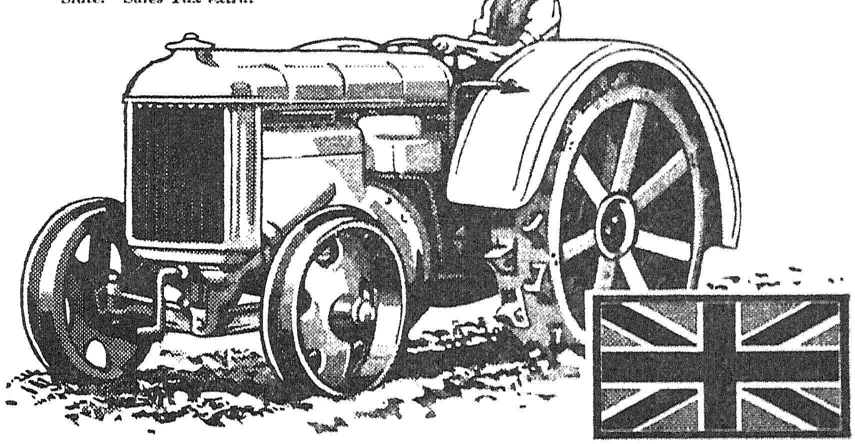

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Poultry Notes.

December.

E. HADLINGTON, Poultry Expert.

Summer Problems.

DURING the summer there are many factors which tend to make a difference in the returns from a poultry farm, and a great deal depends upon the efficiency of management as to whether egg production is satisfactory or not.

As far as the layers are concerned, close attention to feeding is necessary to ensure a seasonable continuity of production; faulty feeding methods are the reason why many poultry-farmers fail to secure the egg production they should during the summer and autumn. It will be found that during a hot spell the birds do not require as much food as usual, and unless judgment is exercised in feeding there is likely to be a sharp decline in the egg yield, due to the hens becoming surfeited with food, resulting in digestive derangement. The wisest course to follow when a heat wave is expected is to reduce the usual quantity of food in accordance with the appetites of the birds, so that no food is allowed to lie around throughout the day. In fact, it is preferable to keep the birds rather keen for their meals, and when a cool change comes, gradually to increase to the normal quantity.

Strict attention should be paid to the watering arrangements to ensure that fresh water is provided and kept as cool as possible. Also that the water vessels are placed in close proximity to the houses; the birds should not have to traverse long distances during the heat of the day to obtain water, as this often leads to high mortality. Where automatic watering systems are fitted, care should be exercised to see that the vessels are kept clean and free from contamination by mash or other organic matter which may cause fermentation; this applies particularly where dry mash is fed.

Ventilation of Houses.

On many poultry farms insufficient ventilation is provided during the summer time. It is quite common to see houses for both young stock and adult birds without an aperture along the top of the back wall under the roof to provide ventilation. This is due to the erroneous idea that an open-fronted house is sufficiently ventilated, but it should be understood that unless a current of air can pass through a house there will not be free circulation of the air. Moreover, by having a fair-sized aperture under the roof much of the heat reflected by the roof is carried off. The deeper the house, the larger the aperture required, and it is a wise plan to have an adjustable shutter to open in the summer time and close in the winter.

Lack of ventilation is one of the causes contributing to an outbreak of catarrh (or "roup") among young stock, particularly towards the end of the summer when the humidity is high, but another even greater evil is having the perches too close together. Despite the frequent warnings which have been issued by the Department in this connection, there are numerous farms where the perches are far too close, both for the young stock and the layers. It should be realised that when birds are packed together on a hot, summer night, they suffer severely through becoming overheated, and this leads to catarrhal troubles, and has a very adverse effect upon egg production under such conditions. The hens will also break into a moult much more quickly than where the birds have good conditions. In some cases the perches are moved when the houses are being cleaned and are not put back into position again, or they are moved in the process of catching birds, and to avoid this occurrence the precaution should be taken of having slots in the roost supports or some other means of keeping the perches in their correct positions—they should not be less than 20 inches apart and about 18 inches above the floor. Some beginners make the mistake of having the perches in step-ladder fashion, and this results in the majority of the birds attempting to get on the highest perch, and consequently leads to packing together. Now is the time to look into these matters and see that everything is right for the summer.

Attention to Birds During Heat Waves.

Each summer thousands of birds are lost from the effects of excessive heat, and yet in the majority of cases these losses may be prevented by following a few simple rules.

In the first place, attention should be given to the matters referred to in the preceding paragraphs. On no account should the farm be left without some one in charge who is capable of handling the birds during a heat wave. As the temperature rises above 100 degrees Fahr. it is necessary to make a continual round of the pens to see that no birds are becoming prostrated with the heat. In doing this it is necessary to disturb gently any birds which may be lying on the floor to see if they are affected. Those which are becoming affected will not move readily and will exhibit obvious signs of distress. Such birds should be removed and water should be applied freely to the head and under the wings; they should then be placed in a shady spot, preferably where there is a current of air, and the ground should be well watered to cool the birds as much as possible. The hens should not be allowed to pack into nest boxes, as they often do in an endeavour to find a cooler spot. Regular rounds of the pens should be made at frequent intervals as long as the temperature remains unduly high.

On no account should water be thrown into houses, as this only creates a humid atmosphere and makes matters worse, but there is no objection to wetting the ground under shade trees or in the shade of buildings where there is a free circulation of air. Where close attention is given during heat waves, not more than a few odd birds should die from the effects of the heat.

A Good Tonic.

AFTER the period of heaviest production a tonic will assist to keep the hens in laying condition, and will also benefit the young stock during the hottest part of the summer. One of the best poultry tonics is that known as Douglas mixture, which can readily be made up on the farm at a small cost. It should be made as follows:—Dissolve 8 oz. of Epsom salts and 8 oz. of sulphate of iron in a gallon of boiling water; allow it to cool and then add 1 oz. of *dilute* sulphuric acid. The mixture should be kept in a glass or earthenware vessel, and labelled "poison." The quantity to use is 1 tablespoonful to each gallon of drinking water, and the tonic should be given three or four times a week for a month.

Clean up the Chicken-rearing Equipment.

ON poultry farms where hatching operations ceased at the end of September, which should be the case on all commercial farms, the brooders will now be empty, and it cannot be too strongly emphasised that no time should be lost in giving the brooding equipment a thorough cleaning up and disinfecting so that the pens may be spelled until the next hatching season. This is a job that is too often neglected—the brooders being left in a dirty condition until they are required again.

All the interior fittings of the brooder house with which the chickens come into contact should be thoroughly scrubbed, including the floor and walls of the brooders, and then the whole plant should be sprayed with a strong disinfectant. The outside runs should also be subjected to a thorough cleaning, and then be left open to the sun; should they become overgrown with weeds later on it is advisable to clear them again, but the grass may be allowed to grow towards the next hatching season.

If the pens have been in use for several years or there has been an outbreak of disease during the past season it is a good idea to remove 3 or 4 inches of soil, and about two months before they are required for use again, refill with fresh, clean soil, which should be rammed down so as to provide a smooth surface. It will be found that this work will be amply repaid by the better results in rearing that will be obtained.

Where weaning pens are provided, these should be treated in a similar manner as regards cleaning, and also the removing of the soil from the runs, if necessary. Again in turn the colony houses should be scrubbed and disinfected and the runs cleaned up as soon as the birds are removed from them. If poultry-farmers would only realise the importance of proper sanitation and of spelling the chicken-rearing equipment between seasons, they would have far less trouble in rearing chickens.

The Christmas Market.

MANY inquiries are received as to whether it is advisable to hold cockerels for the Christmas market or send them in before. This is a matter which largely depends upon the quality of the birds and their age. The usual

experience, however, is that any birds retained for the Christmas trade should be marketed at least a week before Christmas. At the present time some buyers are operating in the export of cockerels, and the prospects are for a well-sustained demand for good birds throughout the season. It would, therefore, appear that the soundest policy is to market the cockerels as they become prime; this means that the birds should be healthy, and weigh from 3½ to 5½ lb., according to the breed. Where conditions permit it would be wise to retain smaller birds until they attain the desired weights. On most farms it is necessary to make room for the pullets, and this will be one of the guiding factors as to whether it would be possible to keep the cockerels for Christmas, but any birds which are not in a healthy condition now are not likely to prove profitable if kept, unless they can be given plenty of range to recuperate.

To Keep Ants Out of Beehives.

Move the hives some feet away from the ants' nests if they happen to be under the hives. Then drive spikes (or stout nails) part way into the corners of some spare bottoms. These spikes will serve as legs. Transfer the hives to these spare bottoms, with each spike in a shallow tin partly filled with water. Cover the surface of the water with old crankcase oil to prevent evaporation.

Provision for Harvesting and Marketing Expenses.

Farmers whose wheat crops are under first lien to the Rural Industries Branch will be provided with harvesting requirements in the same manner as in previous years.

Arrangements have been made for essential harvesting expenses, such as wages, cartage, etc., to be met by a release from the crop proceeds of a small sum per bag as the wheat is delivered. Under this scheme the maximum amount allowable for harvesting, wages, etc., is 6d. per bag in respect of the wheat delivered, and for cartage expenses 1d. per bag per mile, with a maximum of 1s. per bag. These releases will be allowed only if actually necessary. Forms can be obtained by farmers on application to the Rural Industries Branch, Box 2706C, G.P.O., Sydney.

Particulars of the provisions made for cornsacks, twine and crop insurance are also available on application. Duplicate parts, tractor fuel, oil, and harvesting requirements other than those mentioned above, will be dealt with in the usual way. The farmer is expected to keep his expenses as low as possible.

In all requests for harvesting requirements the farmer should furnish particulars of the area of crop to be stripped for grain or cut for hay and the estimated total yield. Where the Rural Industries Branch does not hold the first lien, applications for all harvesting requirements should be made direct to the first lienee.

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